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10 March 1982

CHINA REPORT
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APPLIED SCIENCES

MEDIUM, SMALL COMPUTER APPLICATIONS RESEARCH EMPHASIZED

Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 1, 5 Jan 82 p 3

[Article by Jiang Shifei [5592 1102 7456-7378]: "Emphasize Applications Research, Popularize Medium, Small and Micro Computers"]

[Text] The scope of application of medium, small and micro computers is broad, and they are relatively suited to our nation's present economic situation. They should be developed as a priority. These views are now accepted by most people. But how can computers be developed relatively quickly? People often think that research and development and designing are the difficult aspect and that they require a strong technical team, while using the computers is relatively easy. This kind of thinking occurs naturally in our daily lives. For example, this is indeed true of radios and television sets. But computers are completely different. People often do not recognize this or do not have sufficient understanding. To use computers well so that they will produce visible gains is not a bit easier than research and development and designing. It requires specialized knowledge about the objectives of application, knowledge about software, knowledge about the functional characteristics of the computer and systems engineering. It requires a comprehensive and strong technical team. If we do not employ sufficient forces, if we do not have appropriate organization and arrangement, then, although we may subjectively want to hasten development and application, we still cannot reach our goal. In November this year, when I visited the United States, I visited a computer applications company called Control Systems. This company has 400 scientific and technical personnel in the continental United States, 80 of them are Ph.D.'s, the rest are mostly MA's. The branch of the company in Europe has even more scientific and technical personnel--over 1,000. This company helps clients in energy, environmental protection, aviation, navigation, automation and control of industrial production, and planning and management to solve key technical problems, and it helps clients to design and equip software and hardware systems. The company is well received by its clients and computer manufacturers and it makes money. The clients welcome the company because their key technical problems can be solved. Computerization of their main departments produces visible gains. The computer companies welcome this company because it expands the application and opens up markets for their computers. Concrete demands are made upon the computers and the direction of development of computers is clarified. There are many such companies in the United States. The situation in Japan is similar. For example, the Japan Computer Services Company had only a few hundred

people at the time of founding in 1968. Now, its scientific and technical staff has expanded to 5,000 people, and its business volume has correspondingly grown in multiples.

In the United States, there was also a period of gradual realization of the significance and the difficulty of computer applications. In the beginning, many people did not have sufficient understanding of the important function of computers or they believed that using a computer was a relatively simple task; they even believed that if one had a computer he could solve all the key problems he wanted solved. "Let the genius design it, give it to the idiot to use" reflected the habitual way of thinking that use is always simpler.

In summary, I believe that if everyone, especially the concerned leadership at each level with the power of decision, has a correct understanding of the significance and difficulty of the development of medium, small and micro computers and their applications, then the necessary conditions and prerequisites can be created for rapidly developing our nation's computers.

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APPLIED SCIENCES

PROGRAM IN ONE COMPUTER SYSTEM DUPLICATED IN ANOTHER

Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 1, 5 Jan 82 p 12

[Article by Zhang Juebiao [1728 0628 2871]: "Duplication of Content Between 8-Inch Soft Disc of the Z-80A, B Microcomputer (Dynabyte) and 5-Inch Soft Disc of C Computer (Cromemco S-2) Is Successful"]

[Text] Our nation has imported many Cromemco S-2 microcomputers and Dynabyte microcomputers in recent years. They are widely used in many professions. Although the disc operating systems of these two machines (CDOS, CP/M) are compatible, because the former is equipped with a 5-inch floppy disc drive and the latter is equipped with an 8-inch drive, the method of recording is not entirely the same. Thus, there was no way to duplicating the programs from one to the other. Their systems software and user programs frequently could not be shared, thus affecting the expansion of the functions of the software of these two machines and greatly hindering the popularization and application of the software. For this reason, many units urgently wanted to solve the problem of duplicating the soft discs of these two machines.

The Zhejiang Provincial Computation Institute recently made a breakthrough in the corresponding key technology, and smoothly exchanged the contents on the 8-inch disc and the 5-inch disc of the two types of machines described above. Now the MBASIC and the MZ-80 can operate normally under the control of the CDOS. At the same time, some important user programs can also be mutually duplicated. The entire procedure for duplicating the contents is briefly described below:

1. Use the FORMAT command on the Dynabyte microcomputer to initialize a single-sided single-density 8-inch flexible disc.
2. Use the PI command to copy the programs contained on the 5-inch disc onto this initialized single-sided single-density 8-inch disc.
3. Insert the above 8-inch disc into drive A of a Cromemco S-3 microcomputer and insert another 8-inch disc which has already been initialized on the S-3 microcomputer into drive B.
4. Under RDOS, use the RD and WD commands to read the magnetic tracks and the surface where the programs are located on disc A and write the content onto disc B. Now the duplication of the content between the Dynabyte computer and the S-3 computer is completed.

5. Disconnect one of the 5-inch soft disc drives of the Cromemco S-2 micro-computer and connect it to the interface plug corresponding to the 4FDC insert board on the S-3 computer and designate it as drive C.
6. Use the CDOSGEN command to again generate the CDOS disc operating system of the S-3 computer.
7. Use the XFER command on the S-3 computer to duplicate the programs contained in disc B (8-inch) onto disc C (5-inch). Now the duplication work is completely finished. Using the reverse procedures one can similarly copy the contents from an 8-inch disc onto a 5-inch disc. The most obvious advantage of this method of duplication is that the original disc operating systems and the hardware interface circuits of the disc drives need not be changed. Only a Cromemco S-3 computer is needed to act as the intermediate duplication equipment. An operator with some training can complete the duplication work on his own.

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IMPROVEMENT OF MICROCOMPUTER PERIPHERAL EQUIPMENT URGED

Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 1, 5 Jan 82 p 11

[Article by Lu Yecai [7120 2814 2088]: "Characteristics of the Peripherals of a Microcomputer"]

[Text] In the development of microcomputers, the development of peripherals also occupies an important position. This is because there are many items of peripheral equipment that can be used with the microcomputer, and their manufacturing cost far exceeds that of the mainframe. According to foreign statistics, the ratio between the manufacturing cost of peripheral equipment and that of the mainframe is 3 - 10 to 1. The importance of peripheral equipment is not only reflected in the price; the strength of the entire microcomputer system is determined to a large degree by the peripheral equipment it has. Therefore, in developing the microcomputer, the development of peripheral equipment should be given sufficient attention. Otherwise, a lopsided development will occur. There will only be advanced microcomputers without corresponding peripheral equipment. This will seriously hinder the popularization and use of the microcomputer. It is worth noting that in future popularization and application of computers, the number of microcomputers will undoubtedly be very large, so the manufacture and development of peripherals for microcomputers will occupy a position that cannot be neglected in the computer peripheral equipment industry.

The development of peripheral equipment for microcomputers is similar to the development of peripheral equipment for other type (large, medium, small) computers. An obvious example is that the development of peripherals lags behind the development of the mainframe. But we must also note that the peripheral equipment of the present microcomputers and the small computers does not have a clear line of demarcation. There are two reasons for this: On the one hand, when microcomputers were first developed, they borrowed the peripheral equipment of small computers. On the other hand, because the performance of microcomputers has continuously improved and has gradually approached that of small computers, therefore the peripheral equipment of small computers is also suitable for use with microcomputers. But viewing the trend of development, we see that since microcomputers have their own characteristics in structure, price and use, therefore they also have definite demands for peripheral equipment. Thus, the peripheral equipment of microcomputers has its own characteristics. In summary, there are generally the following:

1. Low price. Low price is an important index of the peripheral equipment of microcomputers. Because in the entire microcomputer system, the manufacturing cost of peripheral equipment constitutes a large portion while that of the mainframe is very small, therefore the manufacturing cost of peripheral equipment must be greatly reduced so it can better match the mainframe. In addition, because of the development of large-scale integrated circuits, the price of the mainframe of a microcomputer (microprocessor) and the internal memory are still dropping continuously. Take the 8080 microprocessor as an example: in 1974, each chip cost 135,000 Japanese yen. By January 1977, its price had dropped to 3,900 Japanese yen, a drop to below 3 percent in 2-3 years. But the price of peripheral equipment has scarcely dropped. Therefore the lack of coordination between the two is even more outstanding. A drop in the price of peripheral equipment is a must.

To reduce the manufacturing cost of peripheral equipment of microcomputers, some manufacturers abroad have taken such measures as: A) reducing the number of components (using LSI); B) using the single board structure; C) simplifying assembly; and D) using one power source.

2. High reliability. To realize popular application, the microcomputer must be convenient to use, and the goal is to require little or no maintenance if possible. Therefore, each part of the system, especially peripheral equipment, must be very reliable. Some of the currently used peripheral equipment of microcomputers abroad is built to last for 5 years without maintenance or repair (such as the small magnetic drum). Some is built so that the average interval between breakdowns is 5,000 to 10,000 hours (such as flexible disc drives).

To achieve high reliability, some manufacturers in foreign nations have adopted the following measures: A) using highly reliable components; B) using large-scale integration of parts; C) reducing the number of connecting parts as much as possible; and D) using strong printed circuit boards (such as metallized holes with a protective membrane).

3. Diversified functions. To adapt to the various demands of the users, the function of peripheral equipment of microcomputers must be versatile and diversified. The general method is: 1) To make many models of one machine. One piece of equipment incorporates several devices with different functions, such as the I/O keyboard-display; the display-printer with both display and printing functions; attachment of paper tape punch and read-out device to the ink jet printer. 2) To equip one machine with many functions. This means one item of peripheral equipment can perform many types of functions. For example, a printer that can output words and graphs, and in word output it can output numbers, English letters, as well as Japanese kana syllabary and Chinese characters.

4. Small size and light weight. To make peripheral equipment of microcomputers easy to carry, install and use, generally such equipment must be small in size and light in weight, and it must have small power consumption and produce little noise. Only in this way can it be used on all occasions and be convenient for popularization.

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COLUMN PROVIDES EXAMPLES OF MICROCOMPUTER APPLICATIONS

Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 1, 5 Jan 82 p 9

[Article: "Application of Microcomputers (10)"]

[Text] Editor's Note: In order to further popularize the application of microcomputers, strengthen situation exchange, and avoid duplicative labor, this special column will be changed to "outstanding examples of microcomputer applications" starting this year to report on the application of various types of domestically produced and imported microcomputers. It is hoped that everyone will submit articles enthusiastically so as to make this special column even better.

Hunan University has designed a high school examination data processing system for the Cromemco CS3/7 multiple user microcomputer system to process the grades of examination papers of 100,000 students taking the exam throughout the province.

The Luoyang Bearing Plant's research institute has run the spherical ball bearing design computation program compiled in BASIC on the Cromemco C computer and has improved the speed and quality of the design.

Hangzhou Special Radio Equipment Plant No 1 and other units have joined efforts to design a line cutting machine tool controlled by a TRS-80 I model computer.

The Luoyang Tractor Research Institute has utilized a Z-80A computer with a data-based management system (DBMS) and BASIC language to compile an EMP.1 program with six functional blocks for managing personnel files of that institute. The program can be used for other purposes with minor changes.

The plan of coding the structure of Chinese characters designed by the Hunan Computer Center is being tested on the Z-80C computer, and good results have been obtained in Chinese character input, Chinese text display, Chinese character output and printout.

The Shanghai Organic Chemistry Institute of the Academy of Sciences has debugged the YJT-1 information search applications program on the Z-80 microcomputer, and has established a small document file with reverse file arrangement. The YJT-1 system has two major functions: search and subject indexing. The index is called «CTCCL» (the English abbreviation of the newest list of subjects of research papers in chemistry in our nation). The computer compiles and composes the text and produces it in photoelectric mimeograph form.

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APPLIED SCIENCES

DEVELOPMENT OF COMPUTER APPLICATIONS IN EDUCATION URGED

Beijing JISUANJI SHIJI [CHINA COMPUTERWORLD] in Chinese No 1, 5 Jan 82 p 8

[Article: "Huadong Normal University Develops Two Computer Aided Educational Systems"]

[Text] The Modern Educational Techniques Research Institute of the Huadong Normal University has preliminarily developed successfully two computer aided educational systems: a microcomputer aided BASIC language self-learning system, MCBBI, and a microcomputer aided English teaching supervision system, HUATOE. Recently, these two systems were exhibited at the scientific research achievements exhibition held in celebration of the 30th anniversary of the founding of the university, and they attracted the interest of educational workers.

The MCBBI system is a CAI (computer aided instruction) system suitable for students not majoring in computer science to learn BASIC language on their own. It divides the basic content of BASIC into nine lessons, and the lessons are written in a programmed learning method in a frame structure. The computer executes these lessons, teaches and presents questions to the students, and provides feed-back corresponding to the answers the students give. Each lesson runs for 20 to 30 minutes. After the student finishes these nine lessons, he will have a preliminary grasp of the BASIC computational language and a definite capability to work problems on the computer.

Development of this system began in February 2 years ago. Now, it is run on a Cromemco microcomputer system with four terminals. At the same time, the problems of audio explanation and display of explanations using a small number of Chinese characters have been solved. The audio is provided by the tape recorder controlled by the computer and is synchronized with the displayed frames on the screen of the terminal. Chinese characters are plotted in dot matrix utilizing the available character dot matrix of the terminal. The system began experimental use during the last 10 days of November. This is the first experiment in using a computer to provide individualized instruction in our nation.

Last October, some of the members of an American delegation observed the system providing some of the lessons. They expressed the view that the system "can compare with the popular level in the United States." A paper introducing this system was also read at the Third World Conference on Computer Application in

Education held this July, and it attracted the interest of the delegates. They considered it a CAI system that is suited to China's situation and that can be easily popularized.

The HUATOE system possesses the following four functions:

1. Generation of test papers. The system stores tens of thousands of English-language exercises on flexible discs by category. The system can print one test paper meeting the requirements upon the teacher's request within 2 to 3 minutes.
2. On-line operation and grading of tests. A student enters his identification number and the chapter or section of the lesson he has learned into the system. The system checks the identity of the student and presents a set of questions to the student according to the chapter and section of the lesson he has learned for the student to practice or to test himself. After the student answers the questions on-line, the system immediately grades the test and performs corresponding analysis. At present, the system can be used simultaneously by four students. This can be expanded as the number of terminals increases.
3. Compilation of a vocabulary list for teaching and study and statistical calculation of the frequency of occurrence of single terms. A lesson or an English book can be input into the system. The system will print a statistical table of the vocabulary in that lesson or that book in alphabetical order according to the frequency of occurrence of a single term. At the same time, the system will compile a vocabulary in reverse order for use in teaching or research.
4. Automatic reading of test papers and grading. This is actually an independent system with its own microprocessor. Students fill in their answers on a special answer sheet (such as the TOEFL answer sheet). The teacher places the batch of answer sheets on a transmission mechanism. The information on the sheets is read into the microcomputer via a photoelectric input device. After the microcomputer has "graded" the answers, it prints the grades by student identification numbers and performs corresponding instructional analysis on this test.

Recently, most of the functions of the HUATOE system have been realized on the Cromemco III microcomputer system. The university's common foreign-language group has utilized the system to complete statistics on the vocabulary of the first volume of the New Concept English textbook and subject classification. Input work is being carried out. At present, the fourth function of HUATOE is being intensively developed--hardware equipment for the system of automatic checking and grading of tests. It is estimated that the equipment can begin practical use by February of this year. The possibility of transplanting the above software into the DJS101 computerized instructional system is also being explored.

At present, computers are being widely used in education in many nations. This has been called "the fourth revolution in the history of education" (the first three were the establishment of schools, the use of written language and the invention of printing). In particular, the efficiency of our nation's presently available computers has not been fully developed, and developing the application of computers in education will open up a broad new field.

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MEETING HELD ON COMPUTER AIDED DESIGN, PLOTTING

Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 1, 5 Jan 82 p 5

[Article: "Academic Discussion Meeting on Computer Aided Design and Plotting"]

[Text] The Special Committee on Automation and Computers of the Chinese Electrical Engineering Society and the Special Committee on Computer Applications of the Chinese Automation Society jointly held an academic discussion meeting on computer aided design and plotting in Wuhan from 13 to 17 December 1981. Attending the meeting were over 50 delegates from higher educational institutions, scientific research agencies, designing departments and factories. Over 40 papers were read or exchanged at the meeting (topics of the papers will be published later). The content of the papers covered theoretical research in computer aided design and plotting, establishment of computer aided designing systems, software systems for plotting and research, and development of new types of high-speed plotters and display equipment. These are some of the achievements realized by our nation's aviation, manufacturing, electric power, metallurgy, electronics, chemical engineering, railroad and energy conservation departments in recent years through the exertion efforts in our own nation and by fully developing the presently available computer equipment. They have produced definite economic gains in scientific research and productive practices.

During this academic activity, the achievements were exhibited, experience was exchanged, and it could be seen that computer aided design developed domestically has entered into a new stage of interactive systems. This fully shows that there is a strong potential for developing computer software domestically and there is a definite standard. Delegates to the conference expressed the view that if the concerned sectors actively organize forces, avoid duplicative labor, grasp the key points, and solve the problems of key equipment, the ability to develop computer aided design in the nation can be elevated to a new level before long and computer aided design will develop a greater function in the national economy.

To further promote academic exchange, the special committees plan to hold a second academic discussion meeting in 1983.

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JOINT USE OF DOMESTIC, IMPORTED COMPUTERS DESCRIBED

Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 1, 5 Jan 82 p 5

[Article by Wang Zhimin [3679 1807 3046] and Dong Yongjie [6772 3057 2638]: "New Way to Strengthen the TQ-6"]

[Text] The computational speed of the domestically produced TQ-6 computer is fast, the internal memory capacity is large, and the performance is stable, but its shortcomings is that its software is deficient, its peripheral equipment is backward, and it is difficult to satisfy user demands other than for numerical computation.

Recently, we connected the CS-3 computer imported from the United States to the domestically produced TQ-6 computer, making the CS-3 a preprocessor of the TQ-6 computer. In this way, the two computers can be joined together so that each can develop its strongpoints. This has opened up a new future for the application of the TQ-6 computer.

The CS-3 microprocessor system has rich software support. It has a versatile and varied general-purpose interface. The success in connecting the two machines will make the CS-3 the interfaced computer of the TQ-6 computer, thus enabling the TQ-6 to interface with any computer and improving the versatility of the interface of the TQ-6 computer.

When connecting the CS-3 computer and the TQ-6 computer, we used the general purpose interface board 8P01 of the CS-3 computer, and we utilized a program to simulate the interface functions required by the subchannel of the exchanger of the TQ-6 computer, i.e., the idea of a "soft interface." The subchannel circuit of the exchanger was changed only slightly, and we added three signal changers and six single NAND gate chips, making each machine the other's peripheral equipment, and realized a connection between the two machines.

To check the degree of compatibility of the interface function, we borrowed the supervisor of the 15-subchannel teletype of the TQ-6 computer and utilized program simulation of the function of the teletype on the CS-3 computer. The results showed that the operation of the TQ-6 computer can be controlled by the CS-3 computer exactly as we do on the teletype. Also, it is more convenient and reliable than using the teletype and there is no noise. This showed that if it

is equipped with corresponding software, the CS-3 computer not only can replace the teletype, the photoelectric reader and the perforator, but it can also serve as a preprocessor of the TQ-6 computer. This also means that we can develop or borrow the rich systems software resources of the CS-3 computer. After preprocessing the signals and obtaining intermediate results, we can then let the TQ-6 computer perform the final processing. In this way, we can utilize the advantages of the huge capacity and the fast speed of the TQ-6 computer and we can also develop its I/O versatility, along with using the rich and broad software functions of the CS-3 computer. To the TQ-6 computer, the CS-3 computer is a peripheral processor that has a strong function and that is convenient to use. To the CS-3 computer, the TQ-6 computer is only a large capacity and high-speed computing device. This means of "controlling the large with the small, controlling the strong with the weak" is characteristic of this joint computer system.

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COMPUTER SYSTEM USED TO CHECK FLOUR MILL PRODUCTION

Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 24, 20 Dec 81 p 8

[Article: "Microcomputer Checking System for Flour Mill Passes Evaluation"]

[Text] The Beijing Fourth Flour Plant wanted to conserve food grains (increase the percentage of flour output), reduce electricity consumption, and change the backward situation of flour production. It cooperated with the Electronics Technology Popularization and Application Research Institute of the Fourth Ministry of Machine Building and successfully used a microcomputer to automatically check the flour mill production process on the basis of the already successful use of a small computer (JS-10A computer) checking and control system. The system uses the domestically produced SBC-68 (the DJS-062 single board machine with internal memory expanded to 8K) directly installed at the production site to sample data from the checking meters on the flour mills, and to compute indices of eight indicators-- including the percentage of flour output, the yield, and electricity consumption-- and to display the results. The software includes monitoring and controlling programs, programs for itinerant sampling of flour production indices, and programs to execute computation and display. The software also includes a "trap". Whenever an internal part of the microcomputer malfunctions, it can automatically shift to a special program section and start up again. This has improved the reliability of operation. At the same time, there is also a "software clock" which utilizes a subroutine (occupying only a very small memory space) to divide the main frequency of the computer and to produce various kinds of needed clock signals. The method of input of the signals to the computer is simply by using the interrupt function. This type of single board computer can be used at the production site and requires almost no additional equipment (there is no need to connect the computer to an external clock). This has greatly reduced the manufacturing cost (less than 20,000 yuan). In addition, the double layer shields and the suspension measures have separated the strong ground electricity, weak ground electricity and logic areas and have solved the electromagnetic interference at the production site very well. To enable workers who do not understand computers to operate it, the design of the software and hardware has simplified the operation. There are only two keys (power on key and return key) workers are required to operate. This has been welcomed by the workers.

Since August of this year when this system began operation, it has consistently functioned normally. It has helped workers to understand the results of operation in time and after optimization it has quickly reached the best production condition.

It has conserved food grains and the use of electricity, has produced notable. The entire system's cost was less than 20,000 yuan. Recently, the evaluation meeting held in Beijing decided to popularize this system in the flour industry throughout the whole nation. At the same time, this system can also be popularized in packaged products industries such as chemical fertilizers, farm chemicals, and cement production for checking production indicators.

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CSO: 4008/81

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DOMESTIC COMPUTER CONTROLS ALUMINUM ELECTROLYTIC PROCESS

Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 24, 20 Dec 81 p 8

[Article: "The DJS-062 Computer Controls the Aluminum Electrolytic Production Process and Produces Notable Economic Results"]

[Text] Electrolytic production of aluminum by the Fushun Aluminum Plant was manually operated for a long time. The working environment was poor, the physical health of the workers was seriously affected, and it was difficult for the electrolytic trough to operate under optimum conditions, so it was difficult to increase the production index. To solve these problems, the plant tried using a computer to control the process and spent 1.2 million yuan, but this did not help. Last year, the Physics Department of Liaoning University and the Fushun Aluminum Plant cooperated and tested a domestically produced DJS-062 microcomputer for automatic control of the aluminum electrolytic production process. After exerting considerable effort, automatic control of 19 electrolytic troughs has been completed. The control involves the following:

Every 10 minutes, the electrical resistance of each electrolytic trough is tested, and the anode is adjusted according to the resistance value so that the electrolytic trough operates under the optimum condition;

Every 20 minutes, each electrolytic trough is purged and raw material is fed;

The anode effect alarm sounds and the number of the affected trough is printed.

The computer cumulatively counts electric power consumption.

The adjustment of the anode and the purging and feeding of raw material are under time-shared control, i.e., a cyclic counting method. The anode effect alarm and the cumulative counting of electric power consumption use the interrupt method.

The microcomputer alternately calculates the current and voltage in the trough obtained by sampling and analog-digital conversion and compares the internal resistance of the trough and the standard internal resistance of the trough for each trough. If the two are the same, the anode need not be adjusted. If they are different, the microcomputer will send a signal to the external output circuit's processor to control related relays so that the motor will turn in one direction (or in reverse) to raise or lower the anode to achieve optimum control.

Purging and feeding at fixed intervals are also accomplished by the processor under the control of the microcomputer.

When an anode effect occurs in a certain trough, this triggers the circuit to send out a pulsed signal which is an interrupt request to the microcomputer. After responding, the interrupt program begins operating and sounds an alarm. At the same time, the number of the trough is displayed and typed out. The calculation of electric power consumption is similar to the control of the anode effect. The difference is that the frequency divider sends out the pulse for interrupt request.

The control program fully utilizes the subroutines of the monitor and control program, so the whole program is relatively short and simple, using only 1K bytes. To insure precision of control, computation is carried out in binary 16 bits. For the convenience of the user, the data is displayed and printed out in decimal numbers.

To utilize the microcomputer in a productive environment where the power source arc pulling interference is strong and the spatial magnetic field is very strong (watches are magnetized and iron nails are magnetically held), many measures have been taken to allow the computer to work safely.

The entire system has consistently worked normally since it began operating at the site at the end of 1980. It works 24 hours a day trouble-free. Because the precision of measurements is high, the precision of control is superior to similar foreign control systems. At the same time, its conservation of electricity are saved per ton of aluminum. The 12 electrolytic troughs conserved a total of 100,000 kilowatt-hours of electricity in a 5-month period, and 6.5 tons of anode bars were conserved.

The use of the computer has also greatly elevated the standard of business management, and the labor production rate has greatly increased. The labor intensity of the workers has been reduced and the working environment has been improved, avoiding cyanide poisoning.

The Guiyang Aluminum Plant imported from Japan a whole system of the Z-80 microcomputer equipment to control aluminum electrolysis. The 208 electrolytic troughs were equipped with 208 microcomputers and the plant also equipped itself with another small computer. The scale was large and the cost was high. According to reports, the Japanese company profited a lot from this deal. If the whole nation would popularize the plan to use domestically produced microcomputer controlled electrolysis of aluminum, a large amount of foreign exchange expenditure could be conserved along with a lot of electric power. The investment in domestically produced microcomputer systems is small, the results are quick and they can be very easily popularized throughout the nation.

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APPLIED SCIENCES

VARIOUS APPLICATIONS OF Z-80 MICROCOMPUTER DISCUSSED

Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 24, 20 Dec 81 p 8

[Article: "Applications of the Z-80 Microcomputer (9)"]

[Text] The Dalian Ocean Shipping Academy's Scientific Research Institute has designed an automatic microcomputer control system for the auxiliary boilers on ships. The system's main hardware utilizes the Z-80 chip series. The main program of the applications software uses the compiler and TRS-80 BASIC language for compilation. The main function of the system is itinerant checking of operating parameters of the motorized rudder, printout and warning of overloads, and monitoring and exercising automatic control over combustion inside the auxiliary boiler, shutdown and water level.

The Dalian Ocean Shipping Academy uses the TRS-80 microcomputer to control the ship's governor and for automatic regulation of the ship's speed. The system can also select different speed control plans, perform manual and automatic uninterrupted switchover, online parameter correction and fixing, and evaluate the quality of control and provide warning signals.

The Dalian Ocean Shipping Academy started out from practical application and perfected a type of ambiguity diagnosis model, a computational method and diagnostic steps. The model uses a general purpose program compiled in BASIC language in a man-machine conversational form for diagnosis of malfunctions. This program has been used on the TRS-80 microcomputer (16K RAM, 12 ROM, with keyboard, CRT and magnetic tape drive unit). Using this type of microcomputer-aided diagnostic system enables an ordinary doctor or an ordinary repair worker to perform work like a highly skilled doctor or a very experienced technician.

The Guangzhou Machine Tool Research Institute of the First Ministry of Machine Building has successfully developed a TRS-80 (or domestically produced DG-2) microcomputer controlled industrial robot.

The Guangzhou Machine Tool Research Institute of the First Ministry of Machine Building has successfully developed a TRS-80 microcomputer control system to operate the single-axle high-speed drill for drilling holes in printed circuit boards. The program uses a modular structure. Subroutines are compiled according to different functions and they are accessed layer by layer. In designing the program, software methods were used as much as possible to meet the functional

demands of the object to be controlled. Thus the hardware is simplified, the performance is improved, the cost has been lowered, and the entire system (including TRS-80 microcomputer, CRT, cassette recorder, interface circuit, stepping motor drive circuit, and power source) costs less than 20,000 yuan.

The Guangzhou Electrical Sciences Research Institute used the BASIC language to compile a computational program for single-phase electric motor designs. It is suitable for computing many designs, and revision of the parameters is convenient. The program can be run on the Z-80 computer and the DJS-130 computer.

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APPLIED SCIENCES

U.S. WANG LABORATORIES HOLDS EXHIBITION IN SHANGHAI

Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 1, 5 Jan 82 p 12

[Article: "Shanghai Jiaotong University and Wang Laboratories Jointly Hold Symposium in Shanghai on the Application of Computers in Education and Scientific Research"]

[Text] The Shanghai Jiaotong University and Wang Laboratories of the United States jointly held an exhibition and symposium on the application of computers in education and scientific research from 1 to 5 December on the campus of the Shanghai Jiaotong University. Over 120 delegates from 58 higher educational institutions participated in the symposium and saw the exhibition.

At the meeting, Wang Laboratories sent related experts to introduce that company's series of products, the Chinese language system, the Wang network and the direction of future development of computers. The Shanghai Jiaotong University, the computer station of the Shanghai Materials Supply Bureau, and the Silicates Institute of the Chinese Academy of Sciences also reported on the actual application of Wang computers.

Delegates to the conference devoted attention to the Chinese language system of Wang computers, the comprehensive system and software functions, and were interested in the 32-bit VS-100 computer. That computer's main memory has a capacity of up to 8 megabytes of 32-bit word length. The data channel has 64 bits, the external memory capacity can go up to 4600 megabytes, and the computer can be equipped with 128 terminals and printers. It also has a 32K high-speed buffer memory. The microcommand cycle is only 160 millimicroseconds. It uses a virtual memory operating system, and it has many comprehensive functions, including a Chinese language system and word processing, long-range communications and electronic mail.

It is reported that Wang Laboratories will hold various technical symposiums and demonstrations in Sichuan and Guangzhou in 1982.

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APPLIED SCIENCES

INSTRUCTIONS GIVEN ON HOW TO HANDLE IMPORTED COMPUTERS

Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 24, 20 Dec 81 p 13

[Article by Wang Xiuting [3679 4423 0080] of the Atomic Energy Institute of the Academy of Sciences: "After Receiving an Imported Computer...."]

[Text] In recent years, our nation has imported many computers. The operation varies a great deal. Based on our experience, we consider that it is necessary to talk about what work should be done after receiving an imported computer.

1. Quickly Install It and Begin Operation

After receiving the machine, it must be quickly installed in order to have the entire system begin operation early so that more detailed and overall observation of the machine can be carried out during the warranty period.

Systems that have already been installed should be used comprehensively. This mainly includes the following aspects of work:

- (1) Use the various types of checking programs frequently: inspect the various parts of the machine. This not only provides an examination of the machine, but it also trains maintenance personnel.
- (2) Widely utilize the software and conduct many tests of the various functions of each type of software.
- (3) Train many operators, increase the machine's rate of utilization; it is best to "fully utilize" the machine within 1 or 2 years.

2. Fully Understand the Function of Each Piece of Equipment

After the machine has begun full operation, related information must be carefully read. The various functions of the machine must be understood by using the machine a lot. During the course of eliminating machine malfunctions, we must deepen our understanding of the structure and principle of the equipment. This should be done mainly by starting out from the following three aspects:

- (1) Establish an operating schedule. A set of simple, easily performed and easily memorized operating schedules should be established on the basis of a profound understanding of the principles of the machine. Only in this way can we be sure of the correct use of each piece of equipment.

(2) Work out a rational maintenance method. Routine maintenance is an important task of maintenance personnel. Especially during the initial period of installation, when the machine is relatively new, it does not easily malfunction, and maintenance is frequently the main task. Some maintenance methods stipulated in the inspection certificate are one-sided or even unacceptable. For example, regarding the simple problem of oiling the machinery equipment, the factories often insist that a few drops be added once every few months regardless of our nation's actual conditions. Also for example, the time for changing the air filter of the equipment is frequently arbitrarily stipulated (such as changing it once every few months), disregarding the climatic conditions and the degree of cleanliness of the machinery room at the locality of installation, etc.

These types of problems should be decided on the basis of the actual situation of the users. The manufacturer's stipulations do not have to be adhered to. When the amount of lubricating oil is sufficient, do not add any more; when it is dry, it must be added in time. When the machine is dirty, it should be cleaned. Winds and blowing sand are strong in Beijing (especially in winter and spring), so the time for changing the air filter must be shortened. The interval for cleaning the magnetic discs should also be shortened. In locations where the conditions in machinery rooms are poor, this interval should be appropriately further shortened. But if the equipment is not used for long periods or if it is seldom used, then the interval for changing the air filter can be extended and the interval for cleaning the magnetic discs can also be extended.

(3) Regarding breakdown and maintenance, machinery often breaks down under three conditions: a) because of careless installation or after a long period of operation, the screws or plugs and sockets become loose and cause a breakdown; b) the performance of the devices becomes poor or individual spare parts become seriously worn out, thus causing a breakdown; c) damage to spare parts causes a breakdown. Regardless of which situation occurs, when the machinery breaks down, the malfunction should be located via the checking program.

3. Add Instruments, Equipment and Substitute Devices

(1) New instruments and new equipment must be added. After the computer begins operation, the construction of the machinery room and the laboratory must be included on the daily agenda and some instruments and equipment will have to be added, such as an oscilloscope, a universal meter, testing equipment to test components, transistorized graphic display instruments, and signal generators.

(2) The computer system must be expanded. System expansion requires adding system equipment; for example, to adapt to the massive amount of data output, a line printer must be added. To adapt to multiple users, terminals or character display units must be added. To expand the system's functions, other components must be added and internal memory must be expanded.

(3) Substitution of devices is necessary. Generally, imported machines have a 1- or 2-year supply of spare and reserve parts. But in use, often those parts that have a spare do not break down while those parts that do not have spares often break down. Reordering such parts takes a long time. Therefore, substitution of devices is a major subject in maintaining imported machinery well. Besides

special components and specific parts, devices of imported machines can generally be replaced by domestically produced devices or imitations made by ourselves.

4. Software Problems

After a machine has been installed, personnel should immediately be organized to study the software and to become familiar with the method of using it as soon as possible. During the course of use, personnel should be on the lookout for the following problems:

- (1) Look to see if there is a difference between the actual method of using the software and the method described in the accompanying manual.
- (2) Check the accuracy of error-checking messages.
- (3) When mistakes other than those listed in the manual occur, quickly find out the cause.
- (4) Check to see if the following occurs: The command used was correct (or according to the rules for writing programs) but the computer prints out an error message, or the computer does not print out an error message but the operation of the machine is abnormal.

5. Information Problem

The information provided by the manufacturer is the guide to using and maintaining the computer. In the information, that which is most frequently overlooked is hardware information. Many units wait until the machine breaks down before they read the corresponding information and as a result, the efficiency is very low.

Under ordinary situations, after the machine has begun operation, forces should be organized to translate the information so that the information can better serve its function and the efficiency of the maintenance personnel in eliminating malfunction can be improved.

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APPLIED SCIENCES

ADVANCED COMPUTER NETWORK BUILT IN XIAN

Xian SHAANXI RIBAO in Chinese 14 Jan 82 p 1

[Article by Ren Shide [0117 0013 1795] and Chen Ming [7115 2494]: "Convenient to Use, Sharing Resources, Promoting the Development of Industry, Agriculture and Science and Technology, a Modern Computer Network Is Built in Xian"]

[Text] A computer network using an imported large computer as the mainframe is being built in the Xian area. This construction project was proposed after 2 years of network building experiments. Recently, concerned departments of the State Council held a meeting in our province to exchange experience in the building of computer networks. Its completion will surely push forward industrial and agricultural production and the further development of scientific endeavors.

The computer network connects geographically scattered computers and terminal equipment via communications lines to form a unified whole to bring about convenience and sharing of resources. To quickly establish a computer network in our province, the provincial national defense industry office organized concerned units to perform many experiments and studies according to the directives of the concerned departments of the State Council. Over the past 2 years, this computer network has realized welcomed achievements in the maintenance and use of the mainframe, in testing and construction of communications channels, and in the development of network building equipment. At the same time, on-line testing for structural optimization designing and selection of acupuncture points was carried out and good results were obtained. At the meeting to exchange experience recently held by concerned departments of the State Council, the leading cadres, high ranking engineers, professors, and engineering, scientific and technical personnel totaling over 110 people from 66 units throughout the nation heard a summary report on popularizing computer applications, visited on-line and test sites, and expressed satisfaction over this experiment. They unanimously believed: It is feasible to establish a computer network in the Xian area.

This computer (mainframe) is one of the more advanced computers in our nation at present. Its computational speed can reach 1 million operations a second, its memory storage is large, and it has an advanced laser printer. After importing this equipment, the concerned departments of the State Council proposed to actively develop experimental work in establishing a network for this type of computer to fully develop its function so that its rate of utilization can be improved. A network leadership group was also established. From then on, the provincial national

defense industry office organized various concerned units within and outside the province to share the work and cooperate with each other under the leadership of concerned departments of the State Council and with the massive support of concerned units. Experimental work in establishing the network began at the start of 1980. The central station of networking also held 12 training classes. Over 600 people participated and studied in the classes to help users improve their level of utilization of the computer. The rate of utilization of the computer mainframe started out at 7.4 percent and has now reached 50 percent.

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APPLIED SCIENCES

ENGINE, TRACK SCALE SUCCESSFULLY DEVELOPED

Diesel Engine Booster

Beijing GUANGMING RIBAO in Chinese 1 Feb 82 p 1

[Li Xingwang [2621 5281 2598] and Niu Yin [3662 7336]: "Diesel Engine Booster Developed in Our Nation Reaches International Standard; 150-ton Dynamic Electronic Railroad Track Scale Is Successfully Developed"]

[Text] The GZ 680 exhaust turbine booster jointly designed in cooperation between the Engineering Thermophysics Institute of the Chinese Academy of Sciences and the Ludong Shipyard of the Sixth Ministry of Machine Building has been successfully developed. The experiment to match this booster with the diesel engine of 12,000 horsepower produced by the Ludong Shipyard showed that its performance is good and it has reached international standards.

The turbine booster utilizes the energy in the exhaust of the diesel engine to compress air, and then it fills the cylinder of the diesel engine with pressurized air. The performance of the booster is an important factor that determines the performance of the diesel engine. Using the turbine booster can increase the power of the diesel engine by one half to onefold, and it can also reduce the weight and size of the diesel engine. The turbine booster is widely used in diesel engines at present and its use in some gasoline engines has also begun.

A 20-day comparison test between the turbine booster designed and produced in our nation by ourselves and similar name brand products of the world proved that our booster performs better than the world's name brand products, and its fuel consumption rate is low.

Dynamic Electronic Track Scale

Beijing GUANGMING RIBAO in Chinese 1 Feb 82 p 1

[Text] Our nation's first 150-ton dynamic electronic railroad track scale has been successfully developed by the Hongshan Experimental Machinery Plant in Tianshui and it has passed first level evaluation by the ministry. This has created favorable conditions for strengthening business management and energy conservation.

The dynamic electronic railroad track scale is a modern measuring tool. It is widely used in railroads, mines, harbors, factories. This electronic railroad track scale developed by the Hongshan Experimental Machinery Plant in Tianshui has incorporated the advanced techniques of similar foreign machines. It is the first in our nation to use the whole body structure, spoke sensor, and integrated circuits that have a higher resistance to interference. It can also automatically judge the direction of coming trains and automatically recognize the first and last cars. When a train carrying a full load passes through the mechanical part of this electronic railroad track scale, the operating part's automatic recorder will immediately show the load of each car and the load of the whole train. This 150-ton dynamic electronic railroad track scale was examined and evaluated at the Fuxin Power Plant in Liaoning for over 3 months and over 2 million tons-trips of industrial operation and it proved to perform well. Its measurements were very accurate and it reached the required standards of the design. This railroad track scale will be batch produced by the Hongshan Experimental Machinery Plant in Tianshui.

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APPLIED SCIENCES

ELECTROHYDRAULIC SERVO VALVE DEVELOPMENT, USES DISCUSSED

Beijing JICHUANG [MACHINE TOOL] in Chinese No 11, 1981 pp 27-30

[Article by Gu Ruilong [7357 3843 7893] of the Machine Tool Research Institute of the First Ministry of Machine Building: "The Development and Application of Electrohydraulic Servo Valves"]

[Excerpt] III. Research and Development of Electrohydraulic Servo Valves in Our Nation

The domestic development of electrohydraulic servo valves was launched on two fronts simultaneously. One was the large amount of research and development work started at the beginning of the 1960's in response to the need of the military industry to develop guided missiles and aircraft. Superior achievements were realized. The other was the research begun under the development of numerically controlled machine tools for civilian industries. In 1959, the Machine Tool Research Institute developed an electrohydraulic servo system for numerically controlled machine tools. The central component was the servo valve in the electrohydraulic pulsed motor. Since then, the Machine Tool Institute has continued to study and test-produce hydraulic pressure control components. In 1961, research and design of an electrohydraulic servo system used in electrospark processing machine tools began. An electrohydraulic servo valve with a spray nozzle guard structure was designed and developed. Production of this type of electrohydraulic servo valve began in small quantities in 1970. Design of the QDY series of electrohydraulic servo valve began in 1971. On the basis of continued exploration and improvement, the Machine Tool Research Institute has already developed up to the present time 10 series of 31 varieties (see Table 2). The completeness in specifications surpasses that of Britain's Dowty Company and France's Sopelem Company, and is similar to that of Japan's Tokyo Precision Testing Device [company].

The varieties of the QDY series of servo valves developed by the Machine Tool Research Institute possess the following characteristics:

1. The specifications are relatively complete: We can see from Table 2 that the smallest valve is the QDY 2 series. The flow is 2.5 l/min. The one with the largest flow is the three-stage valve. Its model number is QDY 3-800. Under a 210-bar oil supply pressure, the output flow can reach 1,250 l/min. As long as the national economy needs it, there is the capability to develop valves with an even larger flow.

Table 2

<u>Series number</u>	<u>Chinese Machine Tool Research Institute</u>	<u>Products of the Moog Company of America which are equivalent to the products listed at left</u>	<u>Characteristics</u>
1	QDY 1A-*4, 10, 16, 25	Moog 73 series 77 series	Small-flow electrohydraulic servo valve
2	QDY 1B-32, 40, 63, 80	Moog 72 series Some products	Intermediate-flow electrohydraulic servo valve
3	QDY 1C-100, 125	Moog 72 series Some products	Larger flow electrohydraulic servo valve
4	QDY 2-2.5, 4, 6, 10	Moog 30, 31 series	Small external shape, high-frequency bandwidth
5	QDY 3-125, 250, 400, 800	Moog 79 series	Three-stage electrohydraulic servo valve, large flow
6	QDY 4-125, 250		Large-flow, high-frequency bandwidth, two-stage sliding valve structure
7	QDY 5-3, 6	Moog 61E	Spray nozzle guard single-stage valve
8	QDY 6-4, 10, 20, 40, 60	Moog 76 series	High pressure to 320 bar
9	QDY 7-32, 40, 63	Moog 35	Duplicated Moog structure
10	QDY-8-10, 25	Moog 33-180	Electro-feedback valve, frequency bandwidth especially high

* The figures following the model numbers represent the fixed flow (l/min) of that valve. It is the amount of flow when the valve pressure drops to 70 bar. The operating pressure of most of the valves listed in the table can reach 210 bar. At this time, the zero load flow of the valve is determined by multiplying the fixed flow by the coefficient 1.7. The highest operating pressure of the QDY 6 series is 320 bar; the coefficient is 2.

2. The frequency bandwidth is relatively high: Upon comparison, the frequency bandwidth of ordinary valves is no lower than the products of the same specifications manufactured by the Moog Company. Under certain conditions, it is even higher. If we compare QDY 1B-80 and the Moog 35 with the same specifications, the frequency bandwidth of QDY 1B-80 is higher by more than 20 Hz. Also, for example, the frequency bandwidth of the QDY 8 model electrofeedback valve can reach 350 Hz (-90°) and 500 Hz (-3 dB) when the flow is ± 5 l/min. This is much higher than the frequency bandwidth of the American Moog 33-180 model valve under the same flow.

3. The ability to resist pollution is stronger: Because the spray nozzle and the throttle-opening parameters of the QDY series valves are twice as large as the parameters of the valves of the Moog Company, the possibility of blockage has been greatly lowered.

Because QDY 4 series valves utilize a two-stage sliding valve structure, their ability to resist pollution is even more outstanding.

In Table 2, the QDY 6, QDY 3 and QDY 8 are series that have been newly developed in 1980. Each of them has its own characteristics:

1. QDY 6 series: This is similar to the A076 series valves of the Moog Company of the United States. The main characteristic is that the highest oil supply pressure can reach 320 bar. Therefore its useful range is broad and it is very suitable for rollers that need to use a higher pressure. The operating pressure required by ordinary rollers is above 250 bar. Operating under such a high pressure, the preset level of the valve has an independent oil-supply hole. Oil can be supplied independently at 140 bar. In addition, the zero point of the valve is user adjustable. Also, because the lowest operating pressure of that series is 10 bar, the uses of this series of valves are the broadest. It can be used in low-pressure machine tools, power generation equipment, materials testing machinery of higher pressure and rollers.

2. QDY 3 series: This series of valves corresponds to the D079 series of the Moog Company. It is a series of three-stage valves. The preset stage (which can use the QDY 1, QDY 2, or QDY 6) can be fixed by user request. This valve is equipped with an electrical amplifier. On one end of the main power valve is a straight-line position differential transformer which serves as a position feedback sensor and forms a closed-loop system. The system also has a compensation (calibration) network. The zero load flow of this series can reach 1,250 l/min. This series of valves is the type of valves with the largest specifications batch-produced domestically. Because the valve uses a rational compensation, its frequency bandwidth can reach 40 to 100 Hz. Valves with a small flow have lower frequency bandwidths. The electrical part of the valve is sold together with the valve.

3. QDY 8 series: The frequency bandwidth of this series of valves is very high. Its structure is similar to that of the Moog 33-180. But the United States uses semiconductor strain plate feedback, while the QDY 8 uses a straight-line differential transformer feedback. Because the latter is non-contact feedback, ideal performance is very easily obtained. In the Moog 33-180,

the feedback plate with strain plate attached is made very stiff in order to obtain a high frequency, and therefore the flow is very small. The claimed frequency bandwidth of 500 Hz is obtained only at 0.46 l/min. Using it to drive three-stage valves can produce a high frequency and large flow output. If it is used directly in a control system, the system's frequency bandwidth and the precision of the steady state can all be greatly improved.

In addition, the Machine Tool Research Institute is developing motor-driven servo valves. This type of valve has a better resistance to pollution and is suitable for use in situations where cleanliness of the oil is not controlled too strictly.

IV. Applications and Future of Electrohydraulic Servo Valves

When we talk about the development of electrohydraulic servo valves, we must not be limited to the machine tool industry. This is because the electrohydraulic servo valve was created to meet the needs of the aviation industry. Now it is widely used in all technical fields. In 1969, when our nation launched our first artificial satellite, ground facilities used the electrohydraulic servo valves developed by the Machine Tool Research Institute. From then on, the servo valve developed by the Machine Tool Research Institute has been used in about 60 professions and by 200 units. Sales have reached over 2,000 units. The more important users during recent years are listed in Table 3.

It can be seen from Table 3 that the scope of application of the electrohydraulic servo valve is very broad. Because each system has its own characteristics, this must be taken into consideration when equipping a system with a servo valve. For example, the precise positioning system of a photoengraver requires a positioning precision of 0.2 μ m. All of its work benches use a static pressure-bearing structure. Because of the high precision in positioning, and since the gain of the system is not large enough, the zero deflection of the valve should be controlled to within 0.5 percent of the fixed current. Yet the zero point of electric current on the test platform and the zero point of electric current in the actual equipment could possibly surpass this value. Later, through continuous practice, it was decided to add zeroing in the actual equipment, and so the electrohydraulic servo valve could be more successfully used for high-precision positioning.

According to domestic and foreign industrial development, future applications of electrohydraulic servo valves will mainly be as follows:

1. Rollers: Besides the large rollers, attention should be paid to the rebuilding of some medium and small rollers. The rebuilding of these machinery units will greatly stimulate an increase in the level of steel rolling, copper rolling, and aluminum rolling in our nation.
2. Materials testing machinery: The materials testing machinery produced by the Hongshan Testing Machinery Plant in Tianshui has produced good results in application. The improvement of the standard of the materials testing machinery will require servo valves with even higher performance.

Table 3

<u>Name of equipment using servo valves</u>	<u>Use</u>	<u>Operational situation</u>
Beijing First Machine Tool Plant Four calibration numerically controlled machine tools	Control feeding for the workbench	
Luoyang Copper Processing Plant 600 mm rolling mill	Control the bending rolls and the thickness of rolled works	Industrial operation for 2.5 years
Beijing 507 Power Plant, JB Company gas turbine generators	Control the supply of fuel oil	Industrial operation for 6 years
Materials testing machinery of various specifications made by the Hongshan Materials Testing Machinery Plant in Tianshui	Control acting force	Testing machinery in operation for 4 years
Photoengraving machinery for large-scale integrated circuits	Positioning with precision of $0.2 \mu\text{m}$	
Industrial robot at the Nanning Second Bicycle Plant in Guangxi	Positioning of mechanical hand	
Monocrystalline silicon slicer	Control thickness of slices	
Capital Airport British Trident Simulator	Control simulated movement of fuselage in pilot training	Operating for 4 years
Taian Machine Tool Plant for Production, Construction, and Electrical Processing, in Shandong	Control automatic feed	Operating for 3 years
Large electrospark processing machine tool		
Electric furnace for making steel at the Engineering Machinery Repair Plant of the Jinan Railroad Bureau	Automatic feed	Operating for 6 years
Machinery for testing fatigue of aircraft wings	Test controlling positions	Operating for 4 years

3. Vibration platforms: A high-frequency vibration platform using a two-stage sliding-valve type (QDY 4) servo valve has been successful. As various types of vibration platforms emerge, it is estimated that various types of different demands will be made upon the valves.

4. Industrial robots: The application of servo valves in industrial robots has just begun. As industrial robots develop, it is estimated that the demand for such valves will greatly increase. Because electric motors are bulky, the trend toward using electrohydraulic systems is clear.

5. Military industry use: Because of the increase in the various types of load tests, fatigue tests, simulation tests (training pilots) for aircraft and for guided missiles, shipboard radars, and shipboard stabilizers, we must perform service work well.

6. Other industries: Up to the present, the electrohydraulic servo system has not been used in our nation's light industry sector, but its application in foreign nations has become widespread. For example, in meat-cutting devices, it can control and adjust the uniform thickness of the slices. In firing bricks, the electrohydraulic servo system controls the size and thickness of the bricks. To control the grains in pulp at a certain size, the gaps of the grinder must be controlled. The rigidity of the electrohydraulic servo system is strong, and it is a very suitable system. Using the electrohydraulic servo system to control the stage platform is quick and accurate. Also, for example, systems to line up the cutting edges of magnetic tapes, adhesive tape, and paper can use the electrohydraulic servo valve for control. Engineering machinery and agricultural machinery require an even higher standard of automation, and none of them can do without the electrohydraulic servo system.

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APPLIED SCIENCES

TUNABLE DOUBLE-DISCHARGE TEA CO₂ LASER DEVELOPED

Hefei ZHONGGUO KEXUE JISHU DAXUE XUEBAO [JOURNAL OF CHINA UNIVERSITY OF SCIENCE AND TECHNOLOGY] in Chinese No 11, No 3, 1981 pp 61-67

[Article by Zhang Yunwu [1728 0336 2976], Liu Yushen [0491 3768 3947], Sheng Liusi [4141 0362 0934], Gao Jianmi [7559 1696 6194], Ma Xingxiao [7456 5281 1321] of the Department of Modern Chemistry: "Tunable Double-Discharge TEA CO₂ Laser"; article received by journal on 21 October 1980]

[Text] I. Introduction

As laser chemistry and research in laser-separated isotopes develop, a TEA CO₂ laser that has stable spectral lines, a long life, and a relatively large output is urgently needed. For this reason, we have developed a CP-II tunable double-discharge TEA CO₂ laser. After over a year of scientific research tests, it has proved to perform well.

The key of the TEA CO₂ laser is how it realizes large-area, even-glow discharge. To this end, there are various types of pre-ionization techniques. This device uses a double-discharge structure consisting of three electrodes. This pre-ionization method had already been used by Paul and Bishop² et alii a long time ago with good results. In recent years, brotherly units in our nation have also used this pre-ionization method to acquire experience. On the basis of their work, we made some improvements in the structure of the electrodes and the parameters of the circuits, we improved the discharge, and we considered the interchangeability of the chromatic dispersion cavity and the nondispersive cavity in the structure of the light cavity. When we used the chromatic dispersion cavity, we could select nearly 60 stable CO₂ laser spectral lines; the energy output of each single line was 1 to 2 joules.

II. Basic Structure of the Device

1. The Laser Tube and the Optical (Resonance) Cavity

Diagram 1 gives the schematic diagram of the structure of the laser tube. The main body of the laser tube is an organic glass tube with hard aluminum flanges on two ends. The anode is 90 centimeters long, 8 centimeters wide, 1.7 centimeters thick, and the two ends are arcs 4 centimeters in radius. The four sides are milled into arcs 1.7 centimeters in radius. The part that secures the arcs

can slide across the plane. The surface of the cathode has 10 longitudinal slots (Diagram 1 b). Inside the slots are placed hard glass tubes 0.28 to 0.3 centimeters in outer diameter. Copper wire is placed inside the glass tubes. The outer diameter of the copper wire and the inner diameter of the glass tubes are nearly the same. The center of the copper wire is at the same height as the surface of the cathode. One end of the glass tubes is sealed by heat, and the other end is bent to a 90° angle. Then, the 10 copper wires are connected in parallel to form the trigger. The gap between the anode and the cathode is 3.6 centimeters (Diagram 1 c).

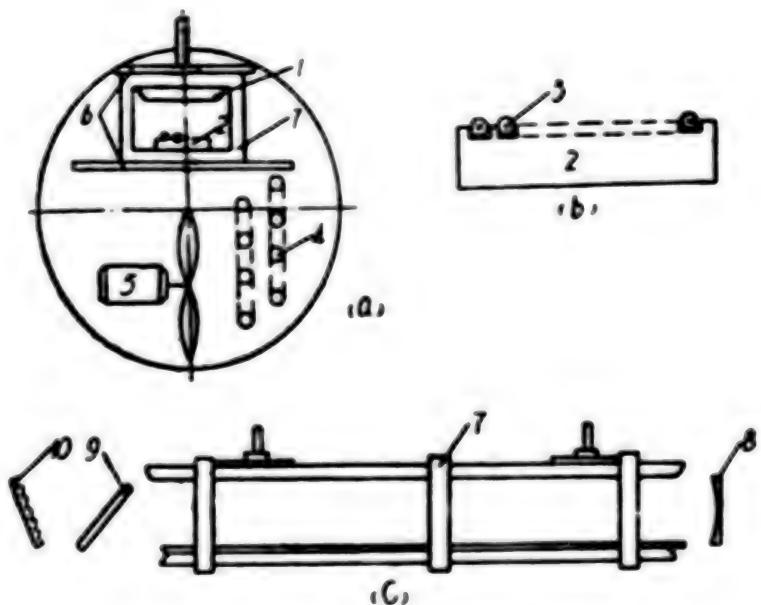


Diagram 1. Illustration of the Structure of the Laser Tube

1. Anode	6. Upper and lower guide boards
2. Cathode	7. Supports for electrodes
3. Glass tube and trigger wire	8. Reflecting mirror
4. Cooling water pipes	9. Brewster's angle window
5. Fan	10. Grate

The nondispersive optical cavity consists of a gold-plated, fully reflecting mirror with a radius of curvature of 600 centimeters and a flat germanium mirror. Replacing the flat germanium mirror by an NaCl Brewster's angle window and adding an infrared reflective grate form a chromatic dispersion optical cavity. The grate is a glass-based, aluminum-plated, primary graduated reflecting grate provided by the Changchun Optical Instruments Institute. Each millimeter has 80 graduations. The swivel table of the grate uses a worm and gear drive mechanism.

2. Excitation Circuit

The excitation circuit of the device is illustrated in Diagram 2. C_1 and C_2 are storage capacitors. The capacitance can be selected within a definite range.

After C_1 and C_2 are determined, the numerical values of C_3 , C_4 , R_2 and L can be carefully adjusted to achieve the best glow discharge. In general, the value of C_3 is 40 to 80 percent of the equivalent capacitance on its left side, C_4 is 11 percent of C_3 ,³ and R_2 is several dozen ohms. The numerical value of L can be estimated by the formula

$$L = \frac{R_2^2 C_3}{4}$$

The capacitors C_1 , C_2 and C_3 are composed of the C804 type 0.1 μ f/30KV low-sensitivity capacitors connected in series parallel; C_4 consists of the C86-type 51 μ f/30KV capacitors in series parallel; R_2 uses an electric furnace filament; L uses a red copper winding.

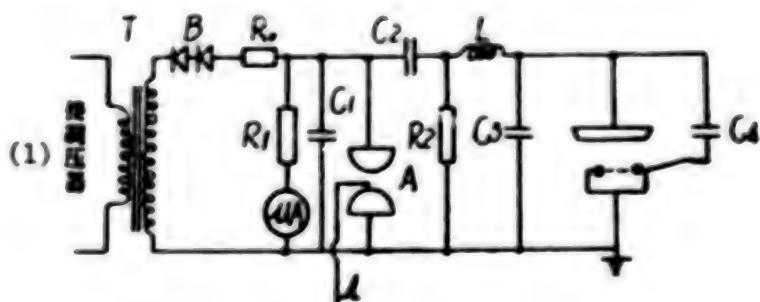


Diagram 2. Excitation Circuit

$$C_1 = C_2 = 0.10 - 0.12 \mu\text{f.}$$

$$R_s = 150\text{K}\Omega.$$

$$L = 5 \mu\text{H}$$

T — Step-up transformer B — Silicon pile A — Air bubble gap

Key: 1. Connected to the pressure regulator

3. Gas Supply System

The operating gas of the laser can be flowing or stationary. Diagram 3 shows the gas supply system of the flowing type. Using this system enables us to adjust the proportion of the mixture of gases and the pressure of the gas inside the laser to achieve a predetermined numerical value and to maintain constancy. This is very important in obtaining a stable energy output. When the operating gas does not need to be flowing, the laser must be pumped to a higher vacuum, and the vacuum must be well maintained. The purity of the operating stationary gas must be higher than that required for a flowing gas so that the operational period between changes of the gas can be longer.

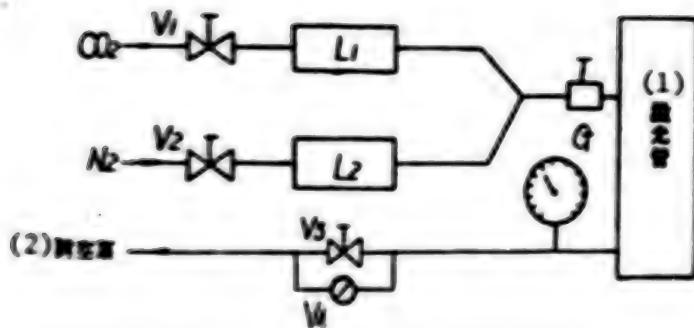


Diagram 3. Gas Supply System

V_1, V_2, V_3 -- adjusting valves, V_4 -- two way valve
 L_1, L_2 -- flow meters, T -- gas inlet, G -- piezometer

Key:

1. Laser
2. Vacuum pump

III. Results and Discussion

1. Selecting the Ratio of Gas Pressure

The operating gas of the TEA CO_2 is generally a mixture of CO_2 , N_2 and He gases. To improve discharge, a small amount of inoculating gas is sometimes added. Table 1 lists the experimental results under different ratios of CO_2 and N_2 . It can be seen from the table that the output energy of the device is larger when the ratio of gases if $P_{\text{CO}_2}:P_{\text{N}_2} = 1:1.5$ to $1:2$ and the total pressure is between 120 torr and 200 torr.

When the ratio of CO_2 and N_2 does not change, adding He gas is not beneficial to the output energy. The results of testing the life of the device, shown later in this article, indicate that He gas shortens the operating life of the mixture of gases (referring to our presently available steel and He gas). Therefore, He gas is not added when this device is operating.

In the experiment of adding triethylamine, we have observed that a small amount of triethylamine can improve the discharge, the operating pressure of the gas, and the output energy (Table 3). But too much triethylamine will cause the glow discharge to disappear. The output energy will drop, and the gold-plated, fully reflecting mirror will be polluted.

Table 1. Effect of the Ratios of CO_2 and N_2 Upon Output Energy (Energy unit: joules)

$\text{CO}_2 : \text{N}_2$ (毛) (2)	(1) 工作电压* (KV)				
	25	26	27	28	29
50 : 50	2.0	2.2	2.3	2.5	有弧 (3)
50 : 75	2.1	2.2	2.3	2.6	2.7
50 : 100	1.8	2.1	2.3	2.6	2.8
60 : 120				2.6	
75 : 150				2.6 (有弧) (3)	

(4) 实验条件: $C_1 = C_2 = 0.10 \mu\text{f}$.

(5) * 指储能电容的充电电压 (下同)

Key:

1. Operating voltage* (KV)
2. (torr)
3. Arc present

4. Experimental condition:
5. *Referring to the charged voltage of the storage capacitor (same in the following)

Table 2. Effect of He Gas Upon the Output Energy E

He (毛) (1)	50	100	150	200	250
E (焦耳) (2)	2.2	2.1	2.0	1.7	1.6

(3) 实验条件: $P_{\text{CO}_2} = P_{\text{He}} = 50$ 毛, $C_1 = C_2 = 0.12 \mu\text{f}$

(4) 工作电压: 25KV

Key:

1. He (torr)
2. E (joules)

3. Experimental condition:
4. Operating voltage:

Table 3. Effect of Triethylamine Upon Output Energy (Energy unit: joules)

$\text{CO}_2 : \text{N}_2 : \text{三乙胺}$ (1) (毛) (3)	(2) 工作电压 (KV)					
	25	26	27	28	29	30
50 : 100 : 0	2.6	2.9	3.2	3.4	3.7	3.8
50 : 100 : 0.4	2.6	3.2	3.5	3.8	3.9	4.2

(4) 实验条件: $C_1 = C_2 = 0.12 \mu\text{f}$

Key:

1. Triethylamine
2. Operating voltage

3. (torr)
4. Experimental condition:

2. The Relationship Between Output Energy and Operating Voltage

We observed the relationship between output energy and operating voltage under the best ratios of gas mixtures. The experimental results (Diagram 4) show that the output energy of that device is tunable within the range from slightly over 0.0 joules to 4 joules. Diagram 4 also illustrates the curve of total efficiency,

$$\eta = E_{\text{output}}/E_{\text{input}}, E_{\text{input}} = \frac{1}{2} (C_1 + C_2)V^2.$$

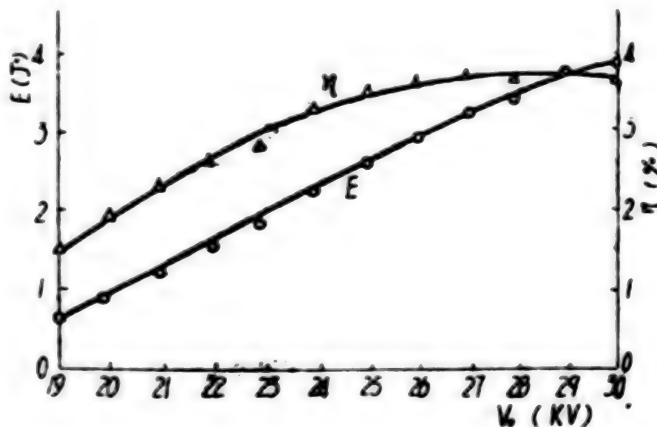


Diagram 4. Relationship Between Output Energy, Total Efficiency, and Operating Voltage

Experimental condition: $P_{\text{CO}_2} : P_{\text{N}_2} = 50 : 100$ (torr)
 $C_1 = C_2 = 0.12 \mu\text{f}$

3. Testing the Life of Stationary Operating Gases

We conducted an experiment to measure the life of stationary operating gases under the best ratios of gas mixtures and a higher operating voltage. The results showed that the device could still operate normally after generating 2×10^4 pulses at 50 pulses a minute without producing an arc. The output energy dropped somewhat (Diagram 5).

The pattern of attenuation of output energy in relation to the number of pulses can be expressed by a function containing two index terms.

$$E = E_0 [\beta e^{-\alpha_1 n} + (1 - \beta) e^{-\alpha_2 n}] \quad (1)$$

Fitting this function and the experimental points yields:

$$\begin{aligned} \alpha_1 &= 0.25 \times 10^{-3}, & \alpha_2 &= 0.01 \times 10^{-3}, \\ E_0 &= 3.07 \text{ joules}, & \beta &= 0.34 \end{aligned} \quad (2)$$

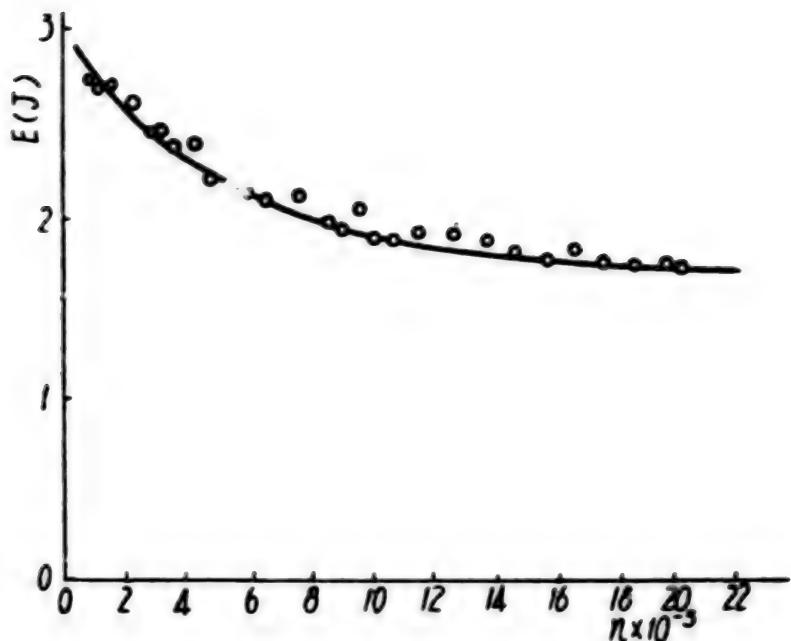


Diagram 5. The Life of Stationary Operating Gas

• — experimental point, — — function
 Experimental conditions: $P_{CO_2} : P_{N_2} = 50 : 100$ (torr),
 $C_1 = C_2 = 0.10 \mu f$
 Operating voltage: 28KV, Repeating frequency: 50 pulses per minute.

The curve of the function is shown by the dotted line in Diagram 5. The experimental data can be described by function (1), showing that energy attenuation corresponds to processes characterized by two main velocities: One is the fast process. From α_1 we know that its characteristic time is 4000 pulses, or 1.3 hours. The other is the slow process. From α_2 we know that its characteristic time is 10^5 pulses, or 33 hours. Obviously, α_1 and α_2 are related to such factors as the operating voltage, the purity of the gases, and the pressure of the gases. By extrapolating from the above formula, we know that the number of pulses when the energy attenuation reaches one-half the initial value is about 7×10^4 . When the operating gas operates in a flowing state, and as long as the amount of flow and the operating voltage are stable, the output energy can maintain stability for a long period of time without producing an arc.

In addition, we conducted experiments to measure the life of the gases by adding He gas and triethylamine. The results showed that both shorten the life of the operating gases.

4. Frequency-Tuning Experiment

Utilizing the frequency-tuning device described above, we observed that 60 oscillating spectral lines (Diagram 6) within the two spectral bands of CO_2 between $00^{\circ}1 - 10^{\circ}0$ and $00^{\circ}1 - 02^{\circ}0$. The energy output of the single spectral

line was 1 to 2 joules. To calibrate the spectral lines, we utilized the 16-A model carbon dioxide laser spectrum analyzer (CO₂ Laser Spectrum Analyzer) manufactured by the American Optical Engineering Company. Most of the spectral lines were stable. For example, we utilized the P(34) line (1033.48 cm⁻¹) of the 00°1 - 02°0 spectral band to conduct an experiment in infrared polymolecular dissociation of methyl alcohol molecules. The output was about 10⁵ pulses. The spectral line did not jump, but the spectral lines near the two ends of each spectral branch jumped frequently. As to the resolution of the spectral lines, we did not observe a visible drop in output energy between two neighboring lines. This showed that the resolution of the dispersive cavity was relatively low.

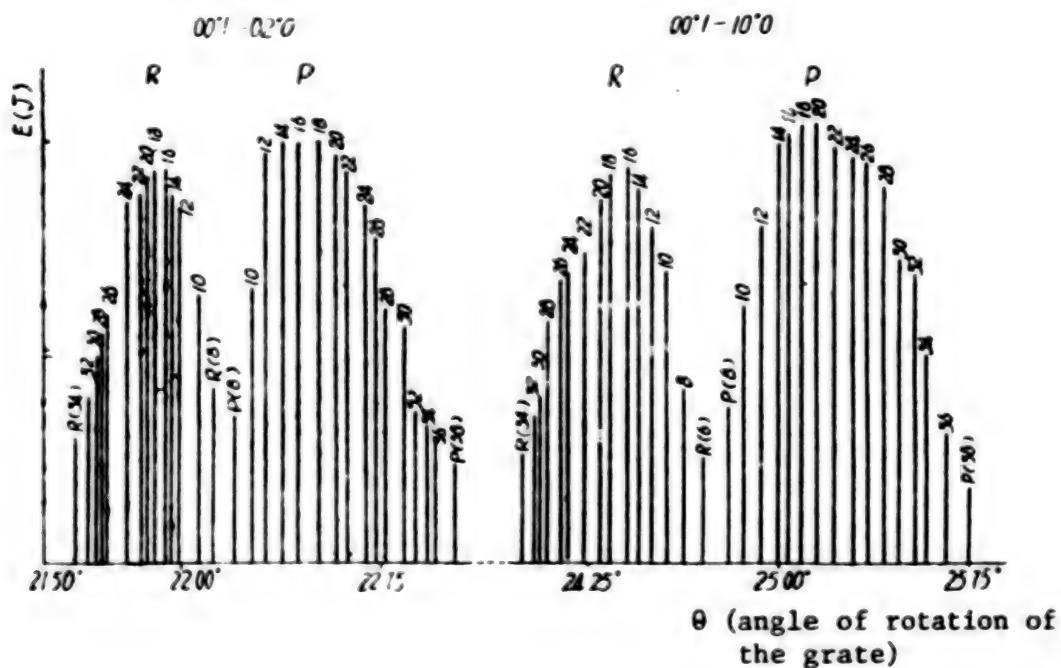


Diagram 6. Spectrum of the Laser

The laser beam was multiple mode. Its diameter was about 2.5 centimeters. On the basis of the length of the cavity (140 centimeters) and the radius of curvature of the totally reflecting mirror (600 centimeters), we calculated the diameter of the basic-mode Gaussian light beam to be only 0.6 centimeters. This was obviously too small. We propose to use a beam-broadening telescopic device to broaden the diameter of the basic-mode Gaussian light beam, improve the resolution of the grating, utilize the area of activation more effectively, and prevent ablation of the grating and the reflecting mirror.

The development of this laser received help from Comrade Xu Qinglai [6079 1987 0171], from our school's machinery plant. We thank him.

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9296

CSO: 4008/63

APPLIED SCIENCES

BRIEFS

DOMESTIC DJS-26 MULTIPROCESSOR SYSTEM--A multiprocessor system of homogeneous unit structure consisting of all domestically manufactured components and parts--the DJS-26 multiprocessor system--recently passed the technical evaluation at the evaluation meeting held by the National Computer Industry Bureau in Guangzhou and it has caught the attention of computer circles. Multiprocessor systems are an important direction of development of present computer technology. The system presented for evaluation was designed by the Huabei Computer Technology Research Institute and trial manufactured by the Guangzhou Computer Plant. The system includes 4 CPUs, 4 signal transfer stations, 20 memory modules, 2 internal buses, 4 external buses, 4 black and white image display units with photopens, 2 color image display units, and general purpose peripheral equipment. The system is equipped with a processor operated system, a graphics software package, compiler language, BASIC language and software, and provides a set of test programs that can conduct overall tests of the system and all its equipment. Each of the system's central processing units can handle a 16-bit word length. Average computational speed is 250,000 operations per second. Before the evaluation meeting, an examining group composed of specialists and engineering and technical personnel from 11 units, including the Computer Institute of the Chinese Academy of Sciences and Qinghua University, examined the system conscientiously and strictly. The system operated normally, steadily and reliably during the examination lasting 210 hours. At the meeting, delegates carried out overall evaluation of the characteristics and functions of the system. Everyone found this system to be advanced in our nation at present. Its successful development not only provides the user with a system that meets the requirements but it has also been a beneficial exploration in the research and development of multiprocessor systems in our nation, and precious experience has been gained. [Text] [Beijing JISUANJI SHIJIE (CHINA COMPUTERWORLD) in Chinese No 24, 20 Dec 81 p 1] 9296

SMALL DJS112-A COMPUTER--In June this year, with the help of the Computer Department of Huadong Normal University, the Guangdong Shaoguan Radio Plant successfully developed a small computer of the 100 series--DJS112-A--which uses an imported semiconductor memory. The machine is a variation of the DJS112 machine. The design and reliability of the analyzer were improved and the logic was simplified, greatly improving performance-cost ratio. The first prototype was shipped to Shanghai and was successfully assembled and debugged. At the end of July this year, it began onsite operation in the weaving machinery monitoring system at the Shanghai 28th Cotton Mill and it has not malfunctioned. The cumulative number of hours of trouble-free operation has surpassed 2,500 hours. At the beginning of

September this year, the National Computer Bureau organized an overall test for this machine. The results showed that its performance is stable and reliable and it meets the design requirements. The DJS112-A uses the 4K static MOS semiconductor memory produced by Motorola Company as a substitute for the magnetic core. The internal memory has been expanded to 32K. On the basis of selecting and using domestically produced medium-scale circuits, the series-parallel computation of the original 112 machine was changed to all-parallel computation, and the new machine was designed for synchronous operation. This reduced the number of devices, reduced the cost, improved reliability, and the speed of the machine was increased. The arithmetic logic commands can perform over 500,000 operations per second, with considerable capacity to spare. Because its accessing commands are even faster than those of the 130 machine, the actual computational speed is slightly higher than that of the 130 machine. The basic peripherals (on one interface board) include not only the "three old standard equipment" but also an eight unit serial interface used for connecting a character display unit or a console monitor typewriter. There is a stand-alone unit for the flexible disc unit. The market price of the DJS112-A computer at present is 68,000 yuan. This price can be lowered according to the needs of the user. [Text] [Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 24. 20 Dec 81 p 11] 9296

COMPARISON OF Z-80 COMPUTER LANGUAGES--The computer room of the Shanghai Internal Combustion Engine Research Institute recently conducted an analysis and comparison of the languages used by the Z-80A and B microcomputer. The Z-80A and B microcomputer is equipped to handle nine languages (three low-level languages and six high-level languages--CBASIC, BASIC-80, Cromemco BASIC, ALGOL, FORTRAN And COBOL). The computational speed and accuracy of five of the languages were compared and the system software required for program compilation and operation and remaining available internal memory were studied. The results showed that in scientific computation, these five languages all have their own advantages and they can adapt to different needs. The conclusions resulting from the analysis are: 1) The computational accuracy of CBASIC and Cromemco BASIC languages are the same, but the speed of CBASIC is extremely slow and CBASIC is not much superior and may eventually be eliminated. 2) In interpretive system programs, the BASIC-80 has obvious advantages. The function is stronger and it especially suited for use by the Z-80A and B machines. Thus, in situations where large numbers of repetitive computations are not required and when these types of programs are not used as standard built-in programs, the BASIC-80 has the advantage of versatility to compile and convenience to debut. 3) As general purpose programs for large numbers of repetitive computations, the ALGOL and FORTRAN languages can be selected. The choice between the two would be decided by the actual situation and the customary use of each. Generally speaking, FORTRAN is superior and more suitable for scientific computation. [Text] [Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 24, 20 Dec 81 p 7] 9296

TQ-6 COMPUTER USER ASSOCIATION--The Second National TQ-6 Computer Users Technical Exchange Meeting has ended satisfactorily. Delegates to the meeting consisted of designers, producers and users. Fifty papers and technical reports were read at the meeting. The meeting exchanged the results and achievements from maintenance to research and development. The content was rich and the scope was broad. Software included the Pascal language, a magnetic disc controller designed by a micro-program, and a multiple track magnetic disc document system. Hardware included an interface for the magnetic tape drive equipped with the EC5517 system, an interface

for the Kennedy 9300 magnetic tape drive, a real-time interrupt assembly for time-shared operations, and an interface for the 300 LM wide-line printer. Also, experience in moving the machinery and in the maintenance of various types of machinery and operation were introduced. These topics were all welcomed by the delegates. Those present fully confirmed the increasing stability of the domestically manufactured large computers and the year by year increase in reliability and usefulness. The machines are developing an important function in the various fields of the national economy in scientific computation, data processing and simulation experiments. To facilitate better exchange of achievements in research and development and experience in technological renovation and maintenance, it was decided that a TQ-6 computer user association would be officially established, and the Beijing Total Electronic Engineering Systems Design Department was elected as the unit to serve as head of the association. In the future, an all user conference will be held every 1 or 2 years, and plans call for the publication of a TQ-6 bulletin to report on technical activities, experience in maintenance of the various units and related technological achievements. [Text] [Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 24, 20 Dec 81 p 8] 9296

NORTH CHINA COMPUTER USERS ASSOCIATION--The North China branch of the National NJS100 Series Computer Users Association was founded at an inaugural meeting held 13 to 15 November 1981 in Tianjin. The DJS100 series computer is a small digital computer series that has already been established and has achieved the largest batch production in our nation. Its cost is low, its functions are strong, and its software is mature, stable and reliable. The application of this series of computers is popular and its future is broad. The North China branch of the National DJS100 Series Computer Users Association consists of the membership of the 100 series computer users in the North China region, manufacturers, scientific research units and universities and colleges. Over 100 delegates from Hebei, Shanxi, Inner Mongolia and Tianjin city participated in the inaugural meeting of the branch association. The meeting analyzed the problems of the 100 series computers that need to be solved urgently at present, and it emphasized that in the future, popularization of the application of computers must be strengthened and good technical service must be provided. The meeting adopted the charter of the branch association and established a permanent office. [Text] [Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 1, 5 Jan 82 p 9] ??96

LIBRARY OF MACHINE PROGRAMS--A "commonly used program library for machinery design of spare parts" and an "automatic program compilation and graphics processing system for numerically controlled line cutting" developed by the Beijing Municipal Machinery Bureau and Computer Applications Center of the Beijing Municipal Electromechanics Research Academy recently passed evaluation. The "library of commonly used programs for machinery design of spare parts" now includes 18 commonly used programs for computing transmission shafts, gears, cams, and bearings. Later, the library will be gradually expanded. Some of the programs use the finite element method and optimization design so that spare parts that were difficult to compute manually can now be rapidly and accurately computed. The program library is convenient to use. The forms for users to fill in primary data are easy to understand. Experts believe that the principles and formulas for each of the programs are correct, the results are reliable and they can be popularly applied. The "automatic program compilation and graphics processing system for numerically controlled line cutting" has provided a fast, effective and inexpensive graphics checking method for automatic compilation of XY line cutting. It can save trial processing

machine time for the line cutting machine tools to produce dies, and shorten the time of processing dies. The system's basic software for graphics processing can be independently used for two-dimensional graphics systems. The graphics language is easy to learn and easy to compile. The system hardware is simple. It does not need any plotting inserter. The interface circuit uses a direct connection. The system also combines characteristic digits to control plotting of graphs and solves the problem of abandoned codes. [Text] [Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 1, 5 Jan 82 p 9] 9296

HZD-13 CONSOLE MONITOR TYPEWRITER--The HZD-13 model console monitor typewriter is a new console monitor typewriter designed and produced by the Jiangmen Second Radio Plant of Guangdong utilizing foreign large-scale integrated circuits and keyboards and advanced domestic and foreign technology. The meeting to finalize its design was held on 14 December 1981 at Jiangmen. This console monitor typewriter system is simple in structure. The control portion uses the single board structure. The print head, the character wheel and the ribbon and paper feed mechanism are technologically advanced, the printout is clear, and the line spacing is even. The whole machine is stable and reliable and maintenance is convenient. At the same time, it is small in size and low in noise, power consumption, and cost. Its performance-price ratio has reached an advanced level in the nation. The machine can basically satisfy the present requirements demanded in a console monitor typewriter by domestic computers. It can also serve as a terminal typewriter for microcomputers. The HZD-13 model console monitor typewriter has reached the designed technical indices. It has passed the routine working environment test. The design documentation and diagrams are complete and the machine satisfies related regulations on standardization issued by the Fourth Ministry of Machine Building. Delegates to the conference agreed to finalize the design and begin production. [Text] [Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 1, 5 Jan 82 p 5] 9296

SECOND CONTROLLER FOR TQ-16(709) COMPUTER--The TQ-16(709) is a medium computer that is relatively widely used at present. But in use, this computer has many deficiencies which need urgent improvement. For this reason, the Shanghai Zhongxing Radio Plant and a certain research institute carried out a daring experiment over the past 2 years to equip the TQ-16 (709) computer with a second external controller, abbreviated WB2. The design philosophy of this controller starts out entirely from the user's point of view and has a unique character. By equipping the TQ-16(709) with the WB2, the performance of the entire computer was improved in three aspects: 1) 64 additional peripheral equipment interfaces were added and a foundation was provided for the user to add many types of peripheral equipment in accordance with his own needs; 2) an independent channel for the console controller, which has processing capabilities and which is suitable for use by the TQ-16(709) computer, was made available; 3) Off-line input and output were realized and the efficiency of the whole computer was increased by more than 15 percent. At present, the Shanghai Zhongxing Radio Plant and a certain research institute are continuing their efforts to free the machine from the limitations of cross-bar error correction within 1 year and to provide an entirely new internal memory system so that the computer's stability can be increased by one magnitude. [Text] [Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 1, 5 Jan 82 p 5] 9296

CSO: 4008/82

Computers

AUTHOR: MA Xiwen [7456 1585 2429]

ORG: Beijing University

TITLE: "A Relational Approach to Semantics"

SOURCE: Beijing JISUANJI XUEBAO [CHINESE JOURNAL OF COMPUTERS] in Chinese No 1, 1982 pp 1-10

TEXT OF ENGLISH ABSTRACT: An informal description of the "relational semantics" is given. In this approach, the meaning of the program is described by the relations of the values of the variables in the program. The relations are formalized as wff's in a first-order theory which is an extension of the theory which the program is based on. The advantage is obvious: no special inference rule is needed. All we have to do is translate programs into axioms by some formal rules. Then the properties of the programs, at least the correctness, can be proved in the extended theory in the usual way, for example, by "natural deduction."

AUTHOR: FENG Yulin [7458 3768 3829]

ORG: University of Science and Technology of China

TITLE: "Programming Logic Basis and Strong Terminating Theorem"

SOURCE: Beijing JISUANJI XUEBAO [CHINESE JOURNAL OF COMPUTERS] in Chinese No 1, 1982 pp 11-21

TEXT OF ENGLISH ABSTRACT: An extended dynamic logic is developed by using a special (infinitary) descriptive language as the building basis. Then a theorem that each strong terminating program is equivalent to a loop-free program is proved.

AUTHOR: FANG Zhixi [2455 0037 3356]

ORG: Fudan University

TITLE: "Closure Property of Certain Classes of Languages under Bi-language Form"

SOURCE: Beijing JISUANJI XUEBAO [CHINESE JOURNAL OF COMPUTERS] in Chinese No 1, 1982 pp 22-28

TEXT OF ENGLISH ABSTRACT: Let H be a language over alphabet Ω and L a language over alphabet Σ , each symbol in Ω being a homomorphism or an anti-homomorphism on L . The set $H(L) = \{X(w) | X \in H, w \in L\}$ is said to be a bi-language form. In this paper it is shown that the class of language accepted in real time by nondeterministic reversal-bounded multitape Turing machines, NP and the class of the recursively enumerable sets are closed under bi-language form operations when the homomorphisms are linear-erasing, polynomial-erasing and arbitrary respectively.

AUTHOR: QIAN Hualin [6929 5478 2651]

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TITLE: "A Protocol of Transmitting Routing Information for a Distributed Packet-switched Network"

SOURCE: Beijing JISUANJI XUEBAO [CHINESE JOURNAL OF COMPUTERS] in Chinese No 1, 1982 pp 29-40

TEXT OF ENGLISH ABSTRACT: A routing algorithm with advantages of both the centralized and distributed routings is very attractive and is one of the goals chased by many network designers. Unfortunately, its updating is extremely expensive. The updating scheme proposed by the present paper, imposing a relatively light load on the network, requiring a reasonable CPU time to perform the updating algorithm in each node, and keeping the updating time within an allowable interval, provides an approach to that goal. The proposed algorithm consists of two phases: collecting and disseminating the routing information. By dividing a large network into small groups, it can also be used in large networks. Giving each Messenger and Full Messenger a number, the synchronization between groups and the failure recovery procedure can be easily realized.

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ORG: Huadong Institute of Computing Technology

TITLE: "On the Consistency of Information between Cache and Main Memory"

SOURCE: Beijing JISUANJI XUEBAO [CHINESE JOURNAL OF COMPUTERS] in Chinese No 1, 1982 pp 41-49

TEXT OF ENGLISH ABSTRACT: A discussion is made on the consistency of information between the Cache and Main Memory (MM) in the uniprocessor, processor and I/O, and multiprocessor systems. The causes of nonconsistency are described and analyzed. Several approaches leading to their solution are given, and some points are mentioned for implementation.

AUTHOR: XU Wenxin [6079 2429 0207]
JIN Xiaolong [6855 2556 7893]

ORG: Both of the Shanghai Institute of Railway Technology

TITLE: "A New Algorithm for Computer-aided PLAs Logic Design"

SOURCE: Beijing JISUANJI XUEBAO [CHINESE JOURNAL OF COMPUTERS] in Chinese No 1, 1982 pp 50-58

TEXT OF ENGLISH ABSTRACT: The main objective of computer-aided PLAs logic design is to find out a minimal two-level AND/OR expression for a given switching function. An algorithm for such a purpose, quite different from any others known so far, is presented here based on arithmetic operations on integers which correspond to the minterms of the function. It has advantages of simplicity in data structure, rapidity in problem solving when compared with other procedures, and needs no special requirements for algorithm languages.

AUTHOR: LIU Chunhe [0491 2504 0735]

ORG: Harbin University of Technology

TITLE: "Elimination and Detection of Hazards in Combinational Circuits"

SOURCE: Beijing JISUANJI XUEBAO [CHINESE JOURNAL OF COMPUTERS] in Chinese No 1, 1982 pp 59-66

TEXT OF ENGLISH ABSTRACT: This paper introduces how to eliminate logically logic dynamic (or static) hazards in combinational circuits for a given transition (A/B). A simple method of detecting logic/function dynamic hazards is presented based on two concepts, the pure-logic dynamic hazards and the sub-logic dynamic hazards. Finally, Eichelberger's theorem on the elimination of logic static hazards published in 1964 is modified in this paper.

9717

CSO: 4009/255

Electronics

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ORG: Institute of Electronics, Chinese Academy of Sciences

TITLE: "The Development of Cathode Electronics"

SOURCE: Beijing DIANZIXUE TONGXUN [JOURNAL OF ELECTRONICS] in Chinese No 1, 1982
pp 1-7

TEXT OF ENGLISH ABSTRACT: The interactions between theories of physics and cathode electronics are discussed. Some laws in solid state physics, derived from bulk effect, cannot be effectively applied to electron emission which is mainly a surface phenomenon. On the other hand, most effects of electron emission can be used to probe a solid surface, giving more information to the building up of surface science. The present status and trend of development of cathode electronics are also discussed.

AUTHOR: QIAN Jingren [6929 2529 0088]

ORG: University of Science and Technology of China

TITLE: "Theory of Waveguide Cavities with Slowly Varying Cross Section and Its Application"

SOURCE: Beijing DIANZIXUE TONGXUN [JOURNAL OF ELECTRONICS] in Chinese No 1, 1982
pp 8-19

TEXT OF ENGLISH ABSTRACT: In this paper, from the generalized telegraph equations waveguide cavities with slowly varying cross sections are studied. The mode resonant frequencies and the quality factors (Q's) of these cavities and the field distributions are found when the boundary conditions at the ends and at discontinuities are given. Nonp [sic] modes in an open circular waveguide cavity with slowly varying cross section are studied in some detail, especially the diffractive losses of these modes at the opened ends of the cavity are obtained. Finally, two sets of universal curves for resonant frequencies and Q's are given for the double conic opened cavities which are most frequently used in practice. Some results of experiments prove their use to be rather reliable.

AUTHOR: FAN Yuanwu [2868 0337 2976]

ORG: Shanghai Electrical Traction Supply Department

TITLE: "The Calculation Methods of the Short Circuit Currents in Three-phase Bridge Rectifier Circuits"

SOURCE: Beijing DIANZIXUE TONGXUN [JOURNAL OF ELECTRONICS] in Chinese No 1, 1982 pp 20-34

TEXT OF ENGLISH ABSTRACT: This paper, using analytical methods, describes the calculation methods of external and internal short circuit currents in three-phase bridge rectifiers. A part of the analytical methods is first introduced by the author.

AUTHOR: JIANG Junji [3068 6874 1015]

ORG: Institute of Electronics, Chinese Academy of Sciences

TITLE: "Discussion and Improvements on System Initialization Command File of ALPHA MICRO Computer"

SOURCE: Beijing DIANZIXUE TONGXUN [JOURNAL OF ELECTRONICS] in Chinese No 1, 1982 pp 35-45

TEXT OF ENGLISH ABSTRACT: An investigation of the system initialization command file of ALPHA MICRO computer is described. Methods for reducing the size of the operating system have been studied. Some problems of the original file are pointed out and improvements have been made. The improved file contains five terminals and five jobs while the size of the operating system is less than 16K bytes. Two methods are presented to prevent the abnormal running of the computer caused by users using the MEMORY 0 command simultaneously. A sample of the new file and its experimental results is given. The maximum number of terminals and jobs is also evaluated in view of actual effect.

AUTHOR: DAI Rongxin [2071 2837 2946]

ORG: Wuxi Electron Tube Factory

TITLE: "An Experimental Investigation for Improvement of Edge Resolution of 9" Kinescope"

SOURCE: Beijing DIANZIXUE TONGXUN [JOURNAL OF ELECTRONICS] in Chinese No 1, 1982 pp 46-52

TEXT OF ENGLISH ABSTRACT: In kinescope electron gun design there are three chief factors which affect the final electron beam spot size. These are the magnification factor, the spherical aberration and the space charge effect. In this paper the interrelation between these factors and the resolution is discussed.

In order to reduce beam crossover and divergence angle, some methods which make use of reducing the aperture diameter of G_1 and increasing the spacing between G_1 and G_2 are proposed. By adjusting the position of the electron gun in the kinescope, i.e., increasing the distance between the gun and the yoke, the deflection defocusing which is caused by scattering the magnetic field of the deflection yoke is reduced. Therefore, the focusing performance of the kinescope is improved effectively and its edge resolution is increased.

Test data show that the above methods are excellent, with the increment of edge resolution better than 50 lines.

AUTHOR: WU Shiyi [0124 1193 0001]

ORG: Institute of Electronics, Chinese Academy of Sciences

TITLE: "An Optically Pumped CF_4 Laser"

SOURCE: Beijing DIANZIXUE TONGXUN [JOURNAL OF ELECTRONICS] in Chinese No 1, 1982 pp 53-59

TEXT OF ENGLISH ABSTRACT: The stimulated emission of $16 \mu m$ was obtained as a result of optically pumping CF_4 molecules with the 9R(12) line of the TEA CO_2 laser. The pump efficiency has been increased by narrowing the frequency bandwidth of the CO_2 pump laser with a CW gain cell, and by matching well the pump source to the pumped resonator.

With a pump source energy of 700 mJ, a 25 mJ pulse energy of $16 \mu m$ laser output and an optical quantum efficiency of 7 percent, a pulse width of less than 150 ns was obtained. This laser can be operated pulsed several thousand times with a repetition rate of 0.5 Hz.

The relations between the output energy of the CF_4 laser and some parameters (T , p , E_p) have been determined experimentally.

The result of the 9R(10) pump line is also observed and compared with the result obtained with the high pressure continuously tunable CO_2 laser.

AUTHOR: ZHANG Duoming [1728 1122 2494]
WANG Yuhua [3769 3022 5478]
ZHANG Yulin [4545 3768 2651]

ORG: All of the Institute of Electronics, Chinese Academy of Sciences

TITLE: "Developmental Work on Microchannel Plates"

SOURCE: Beijing DIANZIXUE TONGXUN [JOURNAL OF ELECTRONICS] in Chinese No 1, 1982
pp 60-68

TEXT OF ENGLISH ABSTRACT: The channel electron multiplier arrays (CEMAs), also known as microchannel plates (MCPs), are parallel arrays of many thousands of single electron multiplier channels made with a special type of glass. MCPs are versatile detectors of ions, electrons and photons, providing a large active area of high gain and uniformity.

In this paper, the principle of fundamental operation of the MCP is described briefly. The major process of production of MCPs is presented and fundamental characteristics and applications of the MCP are discussed briefly.

AUTHOR: LIAO Xianheng [1670 7359 1854]
HUANG Huifen [7806 1970 5358]
TANG Bianyu [3282 0593 3768]
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ORG: All of the Institute of Electronics, Chinese Academy of Sciences

TITLE: "A Highly Reliable and Long-life Cathode"

SOURCE: Beijing DIANZIXUE TONGXUN [JOURNAL OF ELECTRONICS] in Chinese No 1, 1982
pp 69-70

TEXT OF ENGLISH ABSTRACT: In this paper, a highly reliable and long-life cathode is described. The emission current density of the cathode is higher than $400 \mu\text{A}/\text{cm}^2$ at 730°C , and has a value of $50\text{--}70 \text{ mA}/\text{cm}^2$ at 550°C . The life of the cathode under different conditions is over 60,000 hours. The result of an oxygen poisoning test is also given.

AUTHOR: ZHU Guomin [2612 0948 3046]
OUYANG Xingcang [2962 7122 5887 0221]
LIU Guiying [0491 2710 5391]

ORG: All of the Institute of Electronics, Chinese Academy of Sciences

TITLE: "A High Electric Field Intensity Fluorescent Screen"

SOURCE: Beijing DIANZIXUE TONGXUN [JOURNAL OF ELECTRONICS] in Chinese No 1, 1982
pp 71-72

TEXT OF ENGLISH ABSTRACT: High electric field intensity fluorescent screen (HEFIFS) plays an important role in low light level imaging devices of the second and third generation image intensifiers. This paper gives a preliminary result in HEFIFS which can operate under electric field intensity of 10-12 kV/mm. Other characteristics of the HEFIFS, such as relative luminosity, spectrum and resolution, are comparable to the conventional fluorescent screen of the first generation image intensifier.

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CSO: 4009/258

Engineering

AUTHOR: YANG Lihua [2799 3810 5478]
CHEN Cuolin [7115 0948 2651]

ORG: Both of the Seismological Bureau of Hebei Province

TITLE: "Intensity Distribution of the Tangshan Earthquake"

SOURCE: Harbin DIZHENGONGCHENG YU GONGCHENG ZHENDONG [EARTHQUAKE ENGINEERING AND ENGINEERING VIBRATION] in Chinese No 1, 1981 pp 1-8

TEXT OF ENGLISH ABSTRACT: Based on the field investigation of the Tangshan earthquake ($M = 7.8$), the map of intensity distribution of the Tangshan earthquake is drawn in this paper. Location of the meizoseismic area is determined within Tangshan City with maximum intensity of XI. Features of intensity distribution of the Tangshan earthquake and the abnormal intensity areas in the earthquake are discussed. The effect of the Luan County earthquake of magnitude 7.1 and its intensity distribution are also discussed.

AUTHOR: GUO Yuxue [6753 3768 1331]
PENG Kezhong [1756 0344 0022]
YU Shuangjiu [0060 7175 0036]
et al.

ORG: All of the Institute of Engineering Mechanics, Chinese Academy of Sciences

TITLE: "Strong-motion Observation of the Tangshan Earthquake"

SOURCE: Harbin DIZHENGONGCHENG YU GONGCHENG ZHENDONG [EARTHQUAKE ENGINEERING AND ENGINEERING VIBRATION] in Chinese No 1, 1981 pp 9-20

TEXT OF ENGLISH ABSTRACT: This paper describes the general features of strong-motion observation of the main shock and aftershocks of the Tangshan earthquake of 28 July 1976 ($M_s = 7.8$) and digitization of the strong-motion records. The correlations between peak acceleration and magnitude as well as epicentral distance and variation of duration with magnitudes are analyzed. The effects of local site conditions, propagation path and source characteristics on the frequency spectra and the response spectra of the ground motion are also discussed. Finally, the paper gives some measurement results of several typical structures observed in the main shock.

AUTHOR: YANG Yucheng [2799 3768 2052]
YANG Liu [2799 2692]
GAO Yunxue [7559 0061 1331]
et al.

ORG: All of the Institute of Engineering Mechanics, Chinese Academy of Sciences

TITLE: "Relation between Damage to Multi-story Brick Buildings and Their Strength during the Tangshan Earthquake"

SOURCE: Harbin DIZHENGONGCHENG YU GONGCHENG ZHENDONG [EARTHQUAKE ENGINEERING AND ENGINEERING VIBRATION] in Chinese No 1, 1981 pp 21-33

TEXT OF ENGLISH ABSTRACT: A comparison between damage to multi-story brick buildings and strength of walls is made in this paper. From the evaluation of earthquake resistance for 65,953 pieces of wall in 301 brick buildings, cracking resistant coefficient K_0 for areas of different intensities and collapse resistant coefficient K_{40} for areas of higher intensities are given respectively for the aseismic design. Therefore, K_0 may also be used as a quantitative measure of earthquake intensity. In addition, the comparison between damage to multi-story brick buildings and their strength in the Tangshan urban district reflects the effect of site conditions. Rock sites and soft soil sites with intercalation of silt clay are both favorable to such buildings.

AUTHOR: WEI Lian [7614 8834]
DAI Guoying [2071 0948 3853]

ORG: Both of the Chinese Academy of Building Research

TITLE: "A Survey of the Collapse of a Three-story Reinforced Concrete Frame Structure in a Factory during the Tangshan Earthquakes"

SOURCE: Harbin DIZHENGONGCHENG YU GONGCHENG ZHENDONG [EARTHQUAKE ENGINEERING AND ENGINEERING VIBRATION] in Chinese No 1, 1981 pp 34-40

TEXT OF ENGLISH ABSTRACT: A three-story reinforced concrete frame structure was severely damaged during the Tangshan earthquake of 28 July 1976. It was soon strengthened, but under the attack of a strong aftershock of 15 November 1976, the structure totally collapsed. Some experimental work on full-size column models subjected to cyclic loading and computer analysis for the nonlinear earthquake response of the structure were made. Other factors were also taken into account in analyzing the causes leading to total collapse of the structure. Suggestions for future considerations in the design and strengthening of similar structures are recommended.

AUTHOR: HU Yuxian [5170 5124 6343]
ZHU Jingqing [2612 6975 3237]
ZHU Li [2612 5461]
HU Yong [5170 0516]

ORG: All of the Institute of Engineering Mechanics, Chinese Academy of Sciences

TITLE: "Identification of Input to Vibrational Structure in Frequency Domain"

SOURCE: Harbin DIZHENGONGCHENG YU GONGCHENG ZHENDONG [EARTHQUAKE ENGINEERING AND ENGINEERING VIBRATION] in Chinese No 1, 1981 pp 41-55

TEXT OF ENGLISH ABSTRACT: Results obtained recently on the subject are presented here. A method of input identification in the frequency domain is given, in which material nonlinearity is considered by an iteration process through equivalent linearization. For strong nonlinearity, an equivalent multi-structure method is proposed with one equivalent structure of higher natural frequencies to take care of the smaller-amplitude high-frequency vibration and another of lower natural frequencies to take care of the larger-amplitude low-frequency vibration of the structure. Problems on convergence-uniqueness and accuracy-error are illustrated through numerical examples using known solutions from numerical computations or shaking-table tests. These examples show that several sets of quite different initial nonlinear levels lead to the same result and are quite close to what really

[Continuation of DIZHENGONGCHENG YU GONGCHENG ZHENDONG No 1, 1981 pp 41-55]

happens. These examples also show that, even for very strong nonlinearity (ductility factor = 6-8), the error is only about 10 percent in maximum acceleration and not large in the response spectrum. Error comes mainly from approximation involved in equivalent linearization.

AUTHOR: LIAO Zhenpeng [1675 2182 7720]
YANG Baipo [2799 2672 0980]
YUAN Yifan [5913 0001 0416]

ORG: All of the Institute of Engineering Mechanics, Chinese Academy of Sciences

TITLE: "Effects of Three-dimensional Topography on Earthquake Ground Motion"

SOURCE: Harbin DIZHENGONGCHENG YU GONGCHENG ZHENDONG [EARTHQUAKE ENGINEERING AND ENGINEERING VIBRATION] in Chinese No 1, 1981 pp 56-77

TEXT OF ENGLISH ABSTRACT: The effect of three-dimensional topography on earthquake ground motion is studied from the point of view of progressive wave by means of the finite difference method. A two-dimensional solution for three-dimensional problems and artificial transmitting boundaries are used to reduce the computing time and storage space. The main results are as follows:

For the case of horizontal ground motion, the rocking of an isolated hill as a whole would take place. Period T_0 of the rocking is just the same as that corresponding to the peak of the ratio of the amplitude spectrum at the top of the hill to that at the ground of free field, and $T_0 = 3.2 R/\beta$ for $H/R = 1/3 - 2/3$, where H is the height of the hill, R , the radius at the base of the hill, and β , the velocity of transversal wave. The existence of this predominant period causes the amplification of the ground motion in free field at the top of the hill, with a factor of 2 to 5. For

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the case of vertical ground motion, the vibration of the whole hill is no longer evident. The vertical motion at the top of the hill is 40-125 percent larger than that on the ground of free field. The effect of the ground depression, considered as an inverted hill, on horizontal or vertical ground motion is far less than that of the hill, the dimension of which is the same as the former. The amplification at the edges of the depression is small, about 25 percent. The motion on the bottom of the depression decreases generally. Three-dimensional theoretical results have been compared with the results for a similar two-dimensional model, and the difference between both results are discussed in association with some macroscopic seismic phenomena.

A comparison has also been made between the theoretical and observational results obtained for an isolated hill in an aftershock of the Haicheng earthquake, 1975. Both are in reasonable agreement. Finally, several problems in numerical computation are discussed.

AUTHOR: CAO Zhiyuan [2580 1807 6678]

ORG: Institute of Engineering Mechanics, Chinese Academy of Sciences

TITLE: "Vibration Equations of the Thick Plates"

SOURCE: Harbin DIZHENGONGCHENG YU GONGCHENG ZHENDONG [EARTHQUAKE ENGINEERING AND ENGINEERING VIBRATION] in Chinese No 1, 1981 pp 78-91

TEXT OF ENGLISH ABSTRACT: In this paper, starting from the fundamental equations of the theory of elasticity, according to the assumption of geometrical similarity of section deformations and using two deformation distributive functions, a generalized vibration equation of thick plates is deduced. This equation includes and unites the various current theories of thick plates. Its corresponding stress expression approaches an exact solution of three-dimensional equations.

AUTHOR: WANG Guangyuan [3769 0342 6678]

DONG Mingyao [5516 2494 5069]

GUO Hua [6753 7520]

ORG: All of the Harbin Civil Engineering Institute

TITLE: "Optimum Rigidity Distribution of Aseismic Design for Multi-story Shear Frames"

SOURCE: Harbin DIZHENGONGCHENG YU GONGCHENG ZHENDONG [EARTHQUAKE ENGINEERING AND ENGINEERING VIBRATION] in Chinese No 1, 1981 pp 92-105

TEXT OF ENGLISH ABSTRACT: Based on analyses and syntheses of the optimum aseismic designs for more than 100 multi-story shear frames, the authors of this paper recommend an equation as the approximate formula of the optimum rigidity distribution for structures of this kind. The equation is:

$$I_i = [1 - (1-\mu) \left(\frac{2n}{n+i} \right)^\lambda \left(\frac{i-1}{n-1} \right)^{1.345}] I_1$$

In the formula, I_i = moment of inertia of the column at the i th floor, n = number of stories of the frame, the required parameters I_1 , μ and λ can be obtained from the given tables (or by corresponding empirical formulas) as functions of the intensity of the earthquake, the soil conditions, the number of stories and the floor weight per unit column of the frame. As these parameters are determined, the approximate optimum rigidity distribution for the designed frame can be obtained directly by the equation.

AUTHOR: XIE Lili [6200 4409 4539]
LI Shabai [2621 3097 4101]
QIAN Qukang [6929 3255 3510]

ORG: All of the Institute of Engineering Mechanics, Chinese Academy of Sciences

TITLE: "Study of the Instrument Correction of Accelerograms Recorded by Accelerograph Coupled with Galvanometers"

SOURCE: Harbin DIZHENGONGCHENG YU GONGCHENG ZHENDONG [EARTHQUAKE ENGINEERING AND ENGINEERING VIBRATION] in Chinese No 1, 1981 pp 106-116

TEXT OF ENGLISH ABSTRACT: In this paper, the effect of the dynamic response of an accelerograph coupled with galvanometers on accelerograms is studied in detail, and two methods for instrument correction, the ideal pendulum method and the differential integral method, are suggested. The computational and experimental analysis show that both methods give satisfactory results in a comparatively wide frequency range and both of them can be recommended as a standard method for analysis. As an example, correction for the accelerogram recorded in the Ninghe earthquake of 15 November 1976 is given. It is shown that the maximum deviation of uncorrected accelerogram from the corrected one is about 35 percent. Moreover, comparison of displacement curves obtained from double integration of the uncorrected and corrected accelerograms reveals that such deviation in accelerograms will give an important effect on integrated displacements, and it is essential to carry out this kind of correction for obtaining more useful information from recorded accelerograms.

AUTHOR: WANG Zhiliang [3769 1807 5328]
HAN Qingyu [7281 3237 1342]

ORG: Both of the General Research Institute of Building and Construction, Ministry of Metallurgical Industry

TITLE: "Analysis of Wave Propagation for the Site Seismic Response, Using the Visco-elastoplastic Model"

SOURCE: Harbin DIZHENGONGCHENG YU GONGCHENG ZHENDONG [EARTHQUAKE ENGINEERING AND ENGINEERING VIBRATION] in Chinese No 1, 1981 pp 117-137

TEXT OF ENGLISH ABSTRACT: Based on the previous study of H.B. Seed and V. Streeter, a new difference approach is presented in this paper, using the characteristic-difference hybrid method. Motion equations of visco-elastoplastic soil under the excitation of seismic shear wave are solved. Introducing the concept of damping degradation coefficient, an improved expression of the nonlinear properties of soil is developed so that the loading and unloading curve, i.e., the generalized Masing curve, is consistent with both the shear modulus-shear strain curve and the damping ratio-shear strain curve.

The seismic response of the soil layer can be evaluated conveniently by the approach and the computed program in the paper. The approach can also be used in the microzonation, considering the effect of site soil and in the computation of response spectra.

Lasers

AUTHOR: LUAN Shaojin [2940 4801 6855]
TAN Weihan [6223 4850 5060]

ORG: Both of the Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences

TITLE: "Light Pressures Produced by Laser Pulse Trains and Their Cooling and Retardation Effects on the Atomic Beams"

SOURCE: Shanghai JIGUANG [LASER JOURNAL] in Chinese No 1, 1982 pp 1-7

TEXT OF ENGLISH ABSTRACT: The expression of light pressures produced by laser pulse trains is obtained by solving the density matrix equation. The effect of the pressures on atomic velocity distribution is calculated and their action is compared with that of the CW laser light. The results show that retardation and cooling would be more effective by using a laser pulse train with appropriate modulation than a CW laser of equal power or even 50 percent higher.

AUTHOR: WANG Runwen [3769 3387 2429]

ORG: Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences

TITLE: "Instabilities of Bounded Plane Plasmas"

SOURCE: Shanghai JIGUANG [LASER JOURNAL] in Chinese No 1, 1982 pp 8-11

TEXT OF ENGLISH ABSTRACT: There are several kinds of nonlinear processes in the interaction between laser light and plane plasmas. Starting from two-wave coupling equations of plasmas, we discuss the instabilities appearing in homogeneous plasmas. If there is dampness, instabilities may appear, and when the damp is so small that it can be neglected, there exists only spatial gain. The analytic solution of inhomogeneous plasma with density varying almost linearly is obtained and the conditions for instabilities are discussed.

AUTHOR: XIE Xiaoxiang [6043 4562 3276]
WANG Ruqing [3076 3067 3237]
SHA Cuohu [3097 0948 3109]
ZHANG Cunhao [1728 1317 3185]

ORG: All of the Dalian Institute of Chemical Physics, Chinese Academy of Sciences

TITLE: "A Miniature Nanosecond e-Beam Generator"

SOURCE: Shanghai JICUANG [LASER JOURNAL] in Chinese No 1, 1982 pp 12-16

TEXT OF ENGLISH ABSTRACT: The construction of a miniature nanosecond e-beam generator suitable for laser-related kinetics studies is described. The e-beam peak current is 7A measured behind a 6 mm diameter e-beam window. The pulse duration (FWHM) is 6~8 ns, and the maximum electron energy is about 107 keV.

AUTHOR: QU Zhimin [2575 1807 2404]
CAI Xueqiang [5591 7185 1730]
XU Yimming [1776 5391 2494]
LI Meiyue [2621 5019 2588]

ORG: All of the Shanghai Institute of Laser Technology

TITLE: "Lippmann Hologram Recorded in Dye Sensitized Dichromated Gelatin with Red Light"

SOURCE: Shanghai JICUANG [LASER JOURNAL] in Chinese No 1, 1982 pp 17-19, 11

TEXT OF ENGLISH ABSTRACT: Spectral sensitization of dichromated gelatin to red light has been carried out using methylene blue as sensitizer. The experimental methods of preparing and processing sensitized gelatin plate are described. The holographic grating was recorded with the red light from the He-Ne laser, and diffraction efficiency of 84 percent was obtained. Lippman hologram reconstructed by white light has been recorded.

AUTHOR: XIE Huanghai [6200 7806 3189]

ORG: Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences

TITLE: "Light Coupling of Stripe-geometry DH GaAlAs Laser into Etched-cladding Tapered-spherical Lens Fibers"

SOURCE: Shanghai JIGUANG [LASER JOURNAL] in Chinese No 1, 1982 pp 20-23

TEXT OF ENGLISH ABSTRACT: This paper reports highly efficient light coupling between stripe-geometry DH GaAlAs lasers and multimode fibers by using etched-cladding tapered-spherical lenses at the ends of the fibers. The mechanism of the highly efficient coupling has been analyzed theoretically and the lens has been designed. We have obtained a coupling efficiency of 90 percent experimentally. It is shown that the coupling efficiency of the etched-cladding tapered-spherical lens described here is the highest. This result agrees with the theoretical analysis.

AUTHOR: WU Huifa [0702 1920 3127]

XU Huide [1776 1920 1795]

FANG Zheng [2455 2973]

CHENG Guanchang [4453 7070 6855/2]

ORG: WU and XU both of the Shanghai Inst. of Ceramics, Chinese Academy of Sciences; FANG and CHENG both of the Shanghai Institute of Laser Technology

TITLE: "Intracavity Frequency-doubling by BNN Crystals in CW Nd:YAG Laser Pumping with Acousto-optic Q-switch"

SOURCE: Shanghai JIGUANG [LASER JOURNAL] in Chinese No 1, 1982 pp 24-27

TEXT OF ENGLISH ABSTRACT: In a continuously pumped and A-O Q-switched Nd:YAG laser, BNN crystal elements are used for intracavity frequency doubling. With this system, a peak output power of 2.56 KW at $0.53 \mu\text{m}$, 1 kHz repetition rate and 75 ns pulse-width has been obtained. Experiments for application of this system have been carried out, and satisfactory results obtained.

AUTHOR: ZHANG Yuchuan [1728 5148 1557]
XIE Yan [6043 3601]

ORG: Both of Beijing Institute of Opto-electric Technology

TITLE: "Capacitor-dumped Nitrogen Laser"

SOURCE: Shanghai JIGUANG [LASER JOURNAL] in Chinese No 1, 1982 pp 28-31

TEXT OF ENGLISH ABSTRACT: The advantages and disadvantages of two types of nitrogen lasers are analyzed, and an energy of 11.5 mJ has been obtained from a capacitor-dumped nitrogen laser.

AUTHOR: SIAN Shuheng [0593 3219 1220]
ZHAO Jiaming [6392 1367 6900]
WANG Changsheng [3769 7022 3932]
LI Sumei [2621 4790 2734]

ORG: All of the Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences

TITLE: "CO₂ Saturated Absorption Observed by Fluorescence Technique"

SOURCE: Shanghai JIGUANG [LASER JOURNAL] in Chinese No 1, 1982 pp 32-34, 31

TEXT OF ENGLISH ABSTRACT: In this paper we describe the principle, arrangements and results of CO₂ saturated absorption observed by the fluorescence technique. The dependence of the signal amplitude of fluorescence dip, width and relative depth on some parameters (pressure of absorption gas amplitude and frequency of modulation, input laser power, etc.) has been measured and the results are discussed.

AUTHOR: WEN Jingsong [3306 2529 1529]
WEI Congyi [7614 0361 3015]

ORG: WEN of the Anhui Institute of Optics and Fine Mechanics, Chinese Academy of Sciences; WEI of the Computer Center, Chinese Academy of Sciences

TITLE: "Frequency Spectrum of Atmospheric Scintillation of Laser Beam in Shanghai"

SOURCE: Shanghai JIGUANG [LASER JOURNAL] in Chinese No 1, 1982 pp 35-40, 64

TEXT OF ENGLISH ABSTRACT: Recently B. Ruth investigated ultraweak photon emission from biological cells with a precision instrument. It was identified as a type of coherently stimulated photon emission. It attracted the attention of many scientists. The present paper will discuss the possibility and conditions of the emergence of stimulated photon emission from the physical viewpoint, and considers it a new interesting development of the exploration for the secrets of the biological systems.

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CSO: 4009/256

AUTHOR: LIANG Wenlie [2733 2429 3525]
CHEN Yuanxing [7115 6678 2502]
SHEN Yiqing [4141 0001 3237]
WANG Zonggang [3769 1350 1511]

ORG: LIANG and CHEN both of the National Institute of Metrology; SHEN and WANG both of the Institute of Telecommunications

TITLE: "Attenuation Standard for Telecommunication Carrier Frequency"

SOURCE: Beijing JILANG XUEBAO [ACTA METROLOGICA SINICA] in Chinese No 1, 1982 pp 1-9

TEXT OF ENGLISH ABSTRACT: This paper describes an attenuation standard for telecommunication carrier frequency developed by the NIM and the Institute of Telecommunications. After having investigated in detail the error transfer relation of the multi-decade two-staged inductive voltage dividers used as an intermediate frequency attenuation standard, we designed and manufactured the inductance IF standard attenuator which is especially suitable to the attenuation calibration in a wide dynamic range. The characteristics of those devices have appreciably improved, such as the linear frequency inverter for lower IF, the 10 kHz IF receiver with high stability low noise and high gain, a constant-level zero indicator with high resolution, as well as the phase-locked frequency and amplitude stabilized signal sources. The frequency range of this apparatus is 10 kHz to 30 MHz and the attenuation measuring range is 0 to 80 dB. The total uncertainty is $\pm(0.005\sim 0.03)$ percent per 10 decibels.

AUTHOR: GAO Juncheng
et al.

ORG: None

TITLE: "The Microcalorimeter for Radium Primary Standard"

SOURCE: Beijing JI LANG XUEBAO [ACTA METROLOGICA SINICA] in Chinese No 1, 1982 pp 10-21

TEXT OF ENGLISH ABSTRACT: This paper describes a new type of heat-flow microcalorimeter which is designed for measuring the activity of radionuclides, especially for radium primary standard. The "stretching effect" in calorimetry was given attention and studied from the multibody point of view. The difficulties arising from the fact that it will take a long time to reach the equilibrium state were overcome by means of the null method of measurement. After having analyzed the relation between the main performance of the calorimeter and the number of thermocouples, a simple formula to determine the optimum number of thermocouples was given and verified through experiments. The phenomenon of uneven temperature distributions along the cups was studied and the reasons were briefly analyzed. Then, after taking measurements, this effect was reduced considerably. Also, a new compensation method, i.e., the correlative compensation method, was proposed. According to this method more satisfactory results can be obtained since room temperature in the laboratory is

[Continuation of JILIANG XUEBAO No 1, 1982 pp 10-21]

not constant and/or the two calorimetric units are not matching. This device is simple in structure and easy to assemble. The standard deviation for single measurement is ± 0.02 percent for measuring 20 mg radium source (about 3 mW).

AUTHOR: YANG Yonggang
et al.

ORG: None

TITLE: "The Development of Laser Power and Energy Standard"

SOURCE: Beijing JILIANG XUEBAO [ACTA METROLOGICA SINICA] in Chinese No 1, 1982
pp 22-26

TEXT OF ENGLISH ABSTRACT: Some standards of laser power and energy at NIM are summarized. They are the cavity radiometer and the water flow power meter for laser power measurement, the cone calorimeter and the volume-absorbing calorimeter for laser energy measurement. Most of them are based on electrical substitution principle and calibrated by electrical power or energy.

The systems for calibration and the devices for stabilizing the lasers are described briefly. Their operating ranges and accuracies are also given.

AUTHOR: CHEN Xiaju
et al.

ORG: None

TITLE: "A Facility for Automated Spectroradiometric Calibrations in a Broad Band"

SOURCE: Beijing JILiang XUEBAO [ACTA METROLOGICA SINICA] in Chinese No 1, 1982
pp 27-32

TEXT OF ENGLISH ABSTRACT: This paper introduces a facility for automated spectroradiometric calibrations with wide wavelength range, developed by NIM. The structure and performance of this system are briefly described. It can be used as a standard instrument for the calibration of radiance and irradiance, with high level automation and faster measurement speed. The repeatability for radiance measurement is ± 0.5 percent to ± 1.5 percent. The repeatability for irradiance measurement is ± 1.5 percent to ± 2.0 percent.

AUTHOR: JIN Tiruo
et al.

ORG: None

TITLE: "He⁶ Optical Pumping Magnetometer of Frequency Follow-up Mode and Its Application to Magnetic Gradiometer"

SOURCE: Beijing JILiang XUEBAO [ACTA METROLOGICA SINICA] in Chinese No 1, 1982
pp 33-41

TEXT OF ENGLISH ABSTRACT: This paper describes a method for designing the optical pumping magnetometer with frequency follow-up mode, and introduces the principle and construction of the He⁶ optical pumping magnetometer. It was used to make a magnetic gradiometer and the consistency between its two channels is better than 0.05γ, so that the geomagnetic field and its gradient can be measured precisely. This instrument can be applied to geophysical study and other measurements of low magnetic fields.

AUTHOR: ZHU Qiankang [6175 0051 1660]
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ORG: Both of the Department of Mechanics, Beijing University

TITLE: "A Simple Constant-temperature Hot-wire Anemometer"

SOURCE: Beijing JILILANG XUEBAO [ACTA METROLOGICA SINICA] in Chinese No 1, 1982
PP 42-51

TEXT OF ENGLISH ABSTRACT: In this paper a simple constant-temperature hot-wire anemometer for turbulence research is described. The dynamic equations of the anemometer which relate the electrical responses \tilde{V} to the input velocity fluctuation \tilde{U} and to the input electronic test signal $E(t)$ are derived. An experimental method for estimating the dynamic performance of the anemometer in response to velocity is discussed.

AUTHOR: SONG Junfeng

ORG: None

TITLE: "On the Confidence in Checking Repeatability of Measuring Instruments"

SOURCE: Beijing JILILANG XUEBAO [ACTA METROLOGICA SINICA] in Chinese No 1, 1982
PP 52-60

TEXT OF ENGLISH ABSTRACT: The characteristic parameters defining the confidence are presented in this paper, the formulas are derived, the numerical values are calculated, and all of these are further proved by experiments. From the point of view of this confidence the relationship between the tolerance values of repeatability R_0 and standard deviation σ_0 is correlated as $R_0 = d_n \sigma_0$, and a new method of checking repeatability is proposed, which can give the confidence within predetermined limits.

AUTHOR: XIE Shunkang

ORG: None

TITLE: "On the Local Effective Emissivities of Diffuse Blackbody Cavities"

SOURCE: Beijing JILILANG XUEBAO [ACTA METROLOGICA SINICA] in Chinese No 1, 1982
pp 61-70

TEXT OF ENGLISH ABSTRACT: A new equation of the Gouffe type for calculating local effective emissivities of the walls of the nonisothermal diffuse blackbody cavities is proposed, and the applications to the isothermal and nonisothermal diffuse conical and cylindrical cavities are described. The calculated results for typical examples are exactly consistent with those obtained from the solutions of exact integral equations. The two parameters, average geometrical factor and temperature correction factor, illustrate the effects of cavity geometry and temperature distribution on the emissivity. Some problems for the nonisothermal cavities, such as the selection of a special reference temperature and the definitions for the relative emissivity and absolute emissivity are also calculated and discussed in this paper.

AUTHOR: HUANG Zhixun

ORG: None

TITLE: "Studies on the Rectangular Waveguide Used in the WBCO Attenuation Primary Standards"

SOURCE: Beijing JILILANG XUEBAO [ACTA METROLOGICA SINICA] in Chinese No 1, 1982
pp 71-74

TEXT OF ENGLISH ABSTRACT: Progress in the WBCO attenuation primary standard is outlined. Calculation has been made for the mode distances between the dominant mode and the higher modes, either the circular cylindrical guide or the rectangular guide, with the same value for the cutoff frequency. Therefore, rectangular waveguides find their use in such equipment as the precision attenuator.

AUTHOR: HAN Ruchun

ORG: None

TITLE: "The Formation of a Ring-shaped Beam in a Cesium Beam Tube"

SOURCE: Beijing JILIANG XUEBAO [ACTA METROLOGICA SINICA] in Chinese No 1, 1982
pp 75-76

TEXT OF ENGLISH ABSTRACT: In order to form a ring-shaped beam in the flop-in system, a kind of conical collimator has been tested. As a smaller output section was obtained, the performance of the cesium oven has been improved. However, the total emission area is increased by a factor of 1.6 and the effective beam intensity rises up to 5 times.

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